ATMOSPHERIC SCIENCE AND AIR ISSUES

in Canada's national parks, 2001.

David Welch, Ph.D.

November, 2002
Report 007

SCIENCE ATMOSPHÉRIQUE ET ENJEUX ATMOSPHÉRIQUES

dans les parcs nationaux du Canada, 2001.

David Welch, Ph.D.

Novembre, 2002
Rapport nº 007

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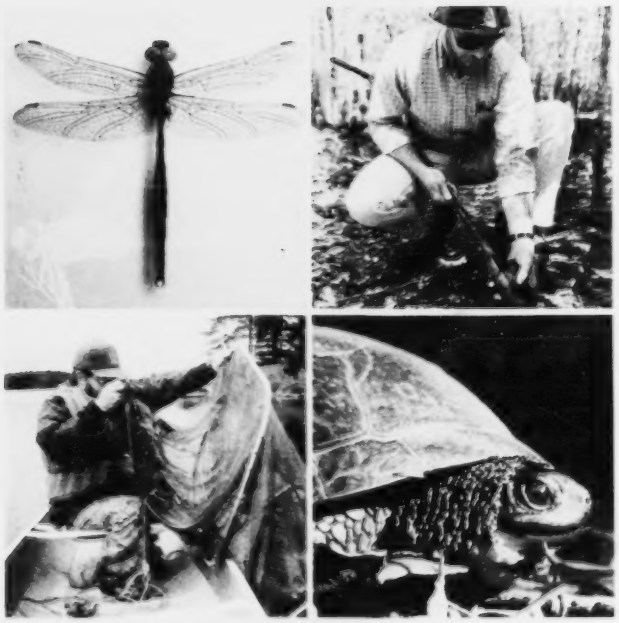
Ecological Integrity
of our Parks



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identifier, tant dans les perceptions des gestionnaires des parcs concernant les questionnaires de 1998 et de 2001, et pour leurs informations au sujet des programmes et des méthodes de recherche et de surveillance. Des remerciements particuliers à cet égard vont à Neil Munro de Parcs Canada, et à Mary Foley, du United States National Park Service, les coprésidents actuels du comité. Dans le même esprit, je tiens à remercier les nombreux collègues d'Environnement Canada, de la United States Environmental Protection Agency et du United States National Park Service, et en particulier Erik Hauge, maintenant à la retraite, pour leur leadership et leur appui au fil de nombreuses années dans le domaine des sciences et des connaissances en matière d'enjeux atmosphériques.

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ABSTRACT

An inventory of atmospheric science activities and concerns at all thirty-nine Canadian national parks was conducted in 1998 and again in 2001. Information was collected on: weather and climate monitoring stations; climate change and air quality monitoring and research, including assessments of ecosystem impacts; related interpretation and outreach programmes and products; air issues of concern to each park; park values at risk due to air issues; and local sources of air pollution. The information captured in 2001 forms the bulk of this report. There was a significant growth in the number of air research and monitoring programmes and projects over the three year interval, from 70 to 86, and only eight parks had neither activity. Most of this work concerned measurements of ambient and deposited air pollutants and their effects upon biota, and tracking indicators of climate change. Interpretation, outreach and staff training in air matters grew only slowly, and over half the parks had no such activity. There was a broad increase in the recognition of air issues in the study interval, and only three parks express no concern with any issues. Climate change is the leading and growing air issue, followed by a suite of air pollutant concerns, of which acid deposition, organochlorines, mercury, particulate matter and UV-B are the leading culprits. Interestingly, though, the concern over stratospheric ozone depletion and elevated UV-B levels declined significantly over the three years. Three quarters of all parks report at least one significant local source of air pollution, most often industrial activities, but also from traffic in park

RÉSUMÉ

Un inventaire des activités et des enjeux dans le domaine des sciences atmosphériques a été établi dans les 39 parcs nationaux du Canada en 1998, et à nouveau en 2001. Des informations ont été réunies sur les stations de surveillance météorologique et climatologique; la surveillance et la recherche en matière de changements climatiques et de qualité de l'air, incluant les évaluations des impacts sur les écosystèmes; les programmes et produits connexes d'interprétation et de diffusion externe; les enjeux atmosphériques intéressant chacun des parcs; les valeurs des parcs menacées par des enjeux atmosphériques; et les sources locales de pollution atmosphérique. Les informations recueillies en 2001 font l'essentiel de ce rapport. Il y a eu une augmentation importante du nombre de programmes et de projets de recherche et de surveillance de l'air dans cet intervalle de trois ans, passant de 70 à 86, et seulement huit parcs n'avaient aucune activité dans ce domaine. La plus grande partie du travail concernait les mesures des polluants atmosphériques ambiants et déposés et leurs effets sur les biotes, et le suivi des indicateurs de changement climatique. L'interprétation, la diffusion externe et la formation du personnel dans le domaine des enjeux atmosphériques n'ont augmenté que lentement, et plus de la moitié des parcs n'avaient aucune activité en ce sens. L'attention portée aux enjeux atmosphériques a beaucoup augmenté au cours des années couvertes par l'étude, et seuls trois parcs ne font état d'aucune préoccupation par rapport à ces enjeux. Le changement climatique est un enjeu atmosphérique important et

town sites and along through transportation corridors, campfire smoke, biomass burning by neighbouring forest managers and farmers, and regional haze from metropolitan areas. In the 2001 survey, particular attention was paid to enumerating weather stations in national parks and those outside that are operated with Parks Canada help. Uncertainties remain about many stations, such as whether a given Meteorological Service of Canada and Park Fire Weather station are one and the same, or two different ones, or such as whether two stations are collocated or one is the replacement for a retired station. One hundred and sixty-five Parks Canada weather stations were identified, up from 120-125 in 1998. Most are in use for general climate recording or to support fire management operations. As well as this 28% growth in station number, many have been automated and upgraded for year-round recording as a climate station.

grandissant, suivi par une série de préoccupations visant les polluants atmosphériques, parmi lesquels les dépôts acides, les organochlorés, le mercure, les matières en suspension et les UV-B sont les principaux. Il est intéressant cependant de constater une diminution importante des préoccupations concernant l'appauvrissement de l'ozone stratosphérique et les niveaux élevés d'UV-B au cours de ces trois années. Les trois quarts de tous les parcs signalent au moins une source locale importante de pollution atmosphérique, la plupart du temps des activités industrielles, mais également le trafic dans les lotissements urbains des parcs et le long des corridors de transit, la fumée des feux de camp, le brûlage de la biomasse par les exploitants forestiers et les fermiers du voisinage, et la brume régionale causée par les zones métropolitaines. Dans l'enquête de 2001, on a porté une attention particulière à l'énumération des stations météorologiques dans les parcs nationaux et à l'extérieur de ceux-ci qui sont exploités avec l'aide de Parcs Canada. Il subsiste des doutes au sujet de nombreuses stations, pour savoir par exemple si une station donnée du Service météorologique du Canada et une station de météorologie dédiée à la gestion du feu sont en fait la même ou deux stations différentes, ou si deux stations se trouvent au même endroit, ou si l'une est le remplacement d'une station désaffectée. Cent soixante-cinq stations météorologiques de Parcs Canada ont été identifiées, alors qu'en 1998, il y en avait entre 120 et 125. La plupart servent à l'enregistrement climatologique général, ou viennent appuyer les opérations de gestion des feux. Le nombre de stations a donc augmenté de 28 %; de

plus, nombreuses sont celles qui ont été automatisées et rénovées pour en faire des stations d'enregistrement climatologique fonctionnant toute l'année.

INTRODUCTION

The national parks of Canada exist to protect for all time representative examples of Canada's natural diversity, and the focus of park management is to restore and maintain the ecological integrity of their ecosystems. The National Parks Act defines ecological integrity as "with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes" (Government of Canada, 2000, clause 2). Implicit in this mandate and definition is the realisation that past and present land uses and environmental stresses have altered and threaten to alter natural systems. These stresses include several atmospheric ones, such as climate change, acid deposition, long range transport of persistent organochlorine pollutants and stratospheric ozone depletion.

In 1995, Parks Canada and the United States National Park Service hosted an international workshop to exchange information about North American air issues affecting national parks and to make recommendations to help the two national park agencies to address air issues (Hauge and Welch, 1996). One of these recommendations lead to the establishment of an air issues contact group to provide park-level information on national park air issues and programmes.

INTRODUCTION

Les parcs nationaux du Canada ont pour but de protéger pour toujours des exemples représentatifs de la diversité naturelle du Canada, et la gestion des parcs est axée sur la restauration et le maintien de l'intégrité écologique de leurs écosystèmes. La *Loi sur les parcs nationaux* définit l'intégrité écologique comme « l'état d'un parc jugé caractéristique de la région naturelle dont il fait partie et qui sera vraisemblablement retenu, notamment les éléments abiotiques, la composition et l'abondance des espèces indigènes et des communautés biologiques ainsi que le rythme des changements et le maintien des processus écologiques » (Gouvernement du Canada, 2000, article 2). Ce mandat et cette définition couvrent de façon implicite le fait que les utilisations passées et présentes des terres et les stress environnementaux ont modifié et menacent de modifier les systèmes naturels. Parmi ces stress se comptent plusieurs de nature atmosphérique, comme le changement climatique, les dépôts acides, le transport à grande distance de polluants organochlorés persistants et l'appauvrissement de l'ozone stratosphérique.

En 1995, Parcs Canada et le United States National Park Service ont organisé un atelier international afin d'échanger des informations au sujet des enjeux atmosphériques nord-américains touchant les parcs nationaux, et de formuler des recommandations destinées à aider les deux agences nationales à traiter les enjeux atmosphériques (Hauge et Welch, 1996). L'une de ces recommandations a donné lieu à la création d'un groupe de personnes-ressources pour les enjeux

In 1998 the group completed a questionnaire on air monitoring, research, interpretation, outreach, management planning activities, air issues and park values at risk from atmospheric stresses. The results of this survey have been included in conference papers addressing national parks and air issues, and in the 1999 state of protected heritage areas report (Parks Canada 2000 a). In 2000 Parks Canada received a major report by an expert panel on the ecological integrity of the national park system (Parks Canada 2000 b), and is attempting to implement its recommendations. They include a major increase to Parks Canada's science and technology capacity, and the establishment of an atmospheric monitoring programme to complement the networks already in place across Canada by enhancing their focus on natural areas. To help guide the design of such a programme, and to guide the development of partnerships in atmospheric science, the 1998 air issues questionnaire was repeated in 2001.

This report documents the 2001 questionnaire and compares the results to those of 1998. The data themselves, as appearing in Appendix 3, are the focus. This report does not offer detailed discussion or conclusions. These may

atmosphériques, chargées de fournir des informations au niveau du parc au sujet des enjeux atmosphériques et des programmes dans les parcs nationaux. En 1998, le groupe a complété un questionnaire au sujet de la surveillance atmosphérique, des activités de recherche, d'interprétation, de diffusion externe et de planification de la gestion, des enjeux atmosphériques et des valeurs des parcs menacées par les stress atmosphériques. Les résultats de ce travail ont été inclus dans des documents de conférence traitant des parcs nationaux et des enjeux environnementaux, et dans le rapport de 1999 sur l'état des aires patrimoniales protégées (Parcs Canada 2000 a). En l'an 2000, Parcs Canada a reçu un rapport important d'un comité d'experts sur l'intégrité écologique du réseau des parcs nationaux (Parcs Canada 2000 b), et cherche maintenant à en mettre en oeuvre les recommandations. Celles-ci comprennent une augmentation importante de la capacité scientifique et technologique de Parcs Canada, et la création d'un programme de surveillance atmosphérique afin de compléter les réseaux déjà en place à travers le Canada en mettant davantage l'accent sur les aires naturelles. Afin d'aider à la mise sur pied d'un tel programme et d'orienter le développement de partenariats en sciences atmosphériques, le questionnaire de 1998 sur les enjeux atmosphériques a été répété en 2001.

Le présent rapport fait état des résultats du questionnaire de 2001 et en compare les résultats à ceux de 1998. Les données elles-mêmes telles qu'elles apparaissent à l'annexe 3 sont l'élément principal. Le rapport ne présente pas de discussions ou

appear in other reports such as future state of protected heritage area reports and conference papers.

METHODOLOGY

The 1998 and 2001 questionnaire designs were similar, and were based on structured questions with instructions and fictional example answers. The questions were organized into groups, such as current monitoring and research, interpretive programmes and recognition of air issues in park management documents. For each question there was a series of prompts for specific aspects. For example, the section asking for details on local air pollution sources asked for emission types, locations of sources, and frequency of occurrences. All answers were invited in free prose, however, rather than selecting items from a checklist. The only significant difference between the two surveys was that the 1998 survey asked for a general, park level statement about weather and climate monitoring stations as a group, whereas the 2001 edition asked for specific details on each station. This anticipated the need for a detailed, national view of weather and climate monitoring to support a potential agreement between Parks Canada and the Meteorological Service of Canada. The 2001 questionnaire is shown in Appendices 1 in English and 2 in French.

de conclusions détaillées. Celles-ci pourront faire partie d'autres rapports, comme les rapports à venir sur l'état des aires patrimoniales protégées et des documents de conférence.

MÉTHODOLOGIE

Les questionnaires de 1998 et de 2001 étaient similaires, et étaient basés sur des questions structurées accompagnées d'instructions et de réponses tirées d'un exemple fictif. Les questions étaient groupées, et portaient sur la surveillance et les recherches en cours, les programmes d'interprétation et la prise en compte des enjeux atmosphériques dans les documents de gestion des parcs. Chaque question était accompagnée de sous-questions visant à obtenir des précisions. Par exemple, la section recherchant des détails sur les sources locales de pollution atmosphérique demandait des précisions sur les types d'émission, la localisation des sources, et la fréquence des occurrences. Les réponses devaient être rédigées librement plutôt qu'en cochant des éléments dans une liste de vérification. La seule différence majeure entre les deux questionnaires était que celui de 1998 demandait un énoncé général au niveau du parc au sujet des stations de surveillance météorologique et climatologique en tant que groupe, alors que celui de 2001 demandait des détails pour chacune des stations. Ces détails étaient recherchés en prévision d'un aperçu national détaillé de la surveillance météorologique et climatologique, à l'appui d'une entente potentielle entre Parcs Canada et le Service météorologique du Canada. Le questionnaire de 2001 apparaît à l'annexe 1 en anglais et à l'annexe 2 en français.

The questionnaire was announced in late April 2001 in the Air Issues Bulletin, an internal electronic newsletter about air issues in national parks, as part of a call for updates to the list of air issues contacts. The questionnaire was e-mailed to field unit superintendents and to the updated air issues contact group in early May, 2001. In several parks, the questionnaire was then passed to another resource specialist for completion. After several broadcast and individually directed reminders, the last return was received in late November 2001. All thirty-nine national parks and both marine parks were accounted for, and information for one national historic site was volunteered. As returns were received, they were checked for consistency both internally and with the 1998 survey. In some cases, questions were redirected to the correspondents for clarification or further completion. Each return was then included in a single compilation file and edited for consistent style. The compilation was e-mailed to all correspondents for a recheck, and some extra corrections and updates up to January 2002 resulted.

Le questionnaire a été annoncé à la fin d'avril 2001 dans le Bulletin sur les enjeux atmosphériques, un bulletin électronique interne traitant des enjeux atmosphériques dans les parcs nationaux, dans le cadre d'un appel à la mise à jour de la liste des personnes-ressources pour les enjeux atmosphériques. Le questionnaire a été envoyé par courrier électronique aux directeurs des unités de gestion et au groupe de personnes-ressources pour les enjeux atmosphériques au début de mai 2001. Dans plusieurs parcs, le questionnaire a alors été transmis à un autre spécialiste des ressources. Après plusieurs rappels généraux et particuliers, les derniers résultats ont été reçus à la fin de novembre 2001. Les 39 parcs nationaux et les deux aires marines ont répondu, et un lieu historique national a volontairement transmis des informations. À la réception des résultats, ceux-ci ont été vérifiés pour en établir la cohérence, tant de façon interne que par rapport à l'enquête de 1998. Dans quelques cas, des questions ont été renvoyées aux correspondants pour éclaircissement ou élaboration. Chacun des résultats a ensuite été inclus dans une compilation unique et a été révisé en vue de la cohérence du style. La compilation a été envoyée par courrier électronique à tous les correspondants pour une nouvelle vérification, ce qui a donné lieu à quelques corrections et mises à jour supplémentaires jusqu'en janvier 2002.

In January 2002, the list of weather and climate stations was checked against the Park Fire Information System and Environment Canada's on-line catalogue of climate stations. Many extra stations were

En janvier 2002, la liste des stations météorologiques et climatologiques a été vérifiée en fonction du système d'information sur les feux et du catalogue en ligne des stations climatologiques d'Environnement Canada. De nombreuses

discovered in this way, and these are included in the compilation.

The edited questionnaire results are included in Appendix 3 in the language submitted by each correspondent. Appendix 4 contains the data base of weather and climate stations.

RESULTS

WEATHER AND CLIMATE MONITORING

Strictly, a weather station captures meteorological data and relays that data in real time, or near to real time, to a central facility in support of daily weather forecasting. A climate station captures meteorological data for the purpose of building a long term data record from which climate normals and weather ranges may be analysed. Thus a climate station may use a data logger and data may be transmitted or collected periodically, in some cases after a few months of winter. Some weather stations, however, are also used as climate stations. All stations operated by the fire management programme are weather stations in the strict sense, whereas many other Parks Canada stations rely on a data logger, and so are properly called climate stations. In this report, however, I use the term "weather" station as shorthand for "weather and/or climate" station. This questionnaire did not address the distinction, and in hindsight I should have asked for this information.

autres stations ont été découvertes de cette façon, et elles ont été incluses dans la compilation.

Les résultats révisés du questionnaire sont donnés à l'annexe 3, dans la langue utilisée par chacun des correspondants. L'annexe 4 contient la base de données des stations météorologiques et climatologiques.

RÉSULTATS

SURVEILLANCE MÉTÉOROLOGIQUE ET CLIMATOLOGIQUE

Dans le sens strict, une station météo saisit des données météorologiques et transmet ces données en temps réel, ou presque en temps réel, à une installation centrale en vue des prévisions météorologiques quotidiennes. Une station climatologique saisit des données météorologiques afin de bâtir un registre des données à long terme à partir duquel les valeurs climatologiques et météorologiques normales peuvent être établies. Ainsi, une station climatologique peut utiliser un enregistreur de données et les données pourront être transmises ou saisies périodiquement, dans certains cas après quelques mois d'hiver. Mais certaines stations météorologiques servent également de stations climatologiques. Toutes les stations utilisées par le programme de gestion des feux sont des stations météorologiques dans le sens strict, alors que beaucoup d'autres stations de Parcs Canada utilisent des enregistreurs de données et sont donc plutôt des stations climatologiques. Dans ce rapport cependant, le terme de station « météorologique » sert à désigner une

station « météorologique et/ou climatologique ». Le questionnaire ne faisait pas la distinction, et en rétrospective, cette distinction aurait dû être recherchée.

The questionnaire returns identified 125 weather stations. However, an examination of the Parks Canada fire information system, the Environment Canada on-line catalogue of climate stations (EC.MSC, 2002), and an Environment Canada overlay of park boundary files on its geographic information system of weather stations identified an additional forty, for a total of 165. Each park was then asked to correct the list as appropriate, resulting in some further additions and deletions. At the time of going to press, I identified 166 Parks Canada weather stations (Table 1). Even so, some of these may be old stations no longer operating, some may be dual stations to provide an overlapping record for station update and site relocation. For more details, see the explanatory notes at the start of Appendix 3. All that can be said with assurance is that Parks Canada owns, operates or houses as many as 166 weather stations, most likely around 155-160, probably no less than 135-140, and that three parks have no stations. Table 1 shows the total number and the principal application of stations in 2001.

D'après les résultats du questionnaire, il y avait 125 stations météo. Cependant, un examen du système d'information sur les feux de Parcs Canada, et le catalogue en ligne de stations climatologiques d'Environnement Canada (EC.MSC, 2002), et un transparent des limites des parcs superposé au système d'information géographique des stations météo d'Environnement Canada ont permis d'identifier 40 autres stations, pour un total de 165. On a alors demandé à chacun des parcs de corriger la liste, le cas échéant, ce qui a donné quelques autres ajouts et suppressions. Au moment de la publication, 166 stations météo de Parcs Canada avaient été identifiées (tableau 1). Certaines cependant peuvent être de vieilles stations qui ne fonctionnent plus, d'autres, des stations doubles fournissant un dossier de recoupements pour la mise à jour des stations et leur relocalisation. Pour d'autres détails, voir les notes explicatives au début de l'annexe 3. Tout ce que l'on peut dire avec assurance, c'est que Parcs Canada possède, exploite ou abrite jusqu'à 166 stations météo, probablement entre 155 et 160, et probablement pas moins de 135 à 140, et que trois parcs n'ont aucune station. Le tableau 1 montre le nombre total et l'application principale des stations en 2001.

These numbers compare with 112 reported in 1998, when four parks out of 38 had no stations. Seventy nine were for general

Ces chiffres se comparent au total de 112 stations signalées en 1998, lorsque quatre parcs sur 38 n'avaient aucune

Table 1. Weather and climate monitoring stations[1]

General purpose	81	MSC registered stations	84
Avalanche	9	PFIS registered stations	77
Fire	71	Neither	37
Glacier	1	Parks with no stations	3
Landslide	1		
Water supply	3	**Total**	**166**

1. This table shows the total number of stations situated within national park and national marine park boundaries and/or operated in part or in whole by Parks Canada even if they are situated outside park boundaries.

Tableau 1. Stations de surveillance météorologique et climatologique[1]

Polyvalentes	81	Stations enregistrées du MSC	84
Avalanches	9	Stations enregistrées du SIFP	77
Feux	71	Autres	37
Glaciers	1	Parcs sans stations	3
Glissements de terrains	1		
Alimentation en eau	3	**Total**	**166**

1. Ce tableau montre le nombre total de stations situées à l'intérieur des limites des parcs nationaux et des aires marines nationales et/ou exploitées en partie ou en tout par Parcs Canada, même si elles sont situées hors des limites des parcs.

purposes, twenty-two were fire weather stations, and eleven were avalanche monitoring stations. Overall there has been a steady growth in the number of meteorology stations in national parks, and there is a continuing trend to automate them and to operate them year-round. Some parks are only constrained by limited budgets from their desire to upgrade to year-round data logging of what are now seasonal stations. Of the year-round stations, there has been an increase of eighteen to forty-three stations wholly owned and operated by Parks Canada, and twenty-two to thirty-four stations operated by other agencies, whereas co-managed stations decreased from thirty-nine to twenty-four. Seasonal stations declined from twenty-two to seventeen for fire weather and eleven to seven for avalanche weather. Some of the

station. Soixante-dix-neuf stations étaient polyvalentes, 22 étaient des stations de météorologie dédiées à la gestion du feu, et 11 étaient des stations de surveillance des avalanches. Dans l'ensemble, il y a eu une croissance régulière du nombre de stations météorologiques dans les parcs nationaux, et la tendance de les automatiser et de les faire fonctionner toute l'année se poursuit. Seules les limites de leurs budgets empêchent certains parcs de passer à l'enregistrement à l'année des données dans les stations qui sont actuellement saisonnières. Dans le cas des stations à l'année, on est passé de 18 à 43 stations appartenant et exploitées entièrement par Parcs Canada, et de 22 à 34 stations exploitées par d'autres agences, tandis que les stations en cogestion ont diminué, passant de 39 à 24. Les stations saisonnières sont passées de 22 à 17 dans

changes may be apparent rather than real, in that some stations reported as fire weather and avalanche weather in 1998 may have been incorrectly regarded by me as seasonal. Also, some fire and avalanche stations have become year-round. Overall, then, we have taken over sole management of many stations, and extended many others to year-round use.

le cas des stations de météorologie dédiées à la gestion du feu et de 11 à 7 dans le cas des stations d'avalanche. Certains de ces changements peuvent être plus apparents que réels, en ce que certaines stations signalées comme stations de météorologie dédiées à la gestion du feu ou stations d'avalanche en 1998 peuvent avoir été considérées incorrectement comme saisonnières. De plus, quelques stations de météo dédiées à la gestion du feu et d'avalanche sont maintenant exploitées à l'année. Dans l'ensemble donc, nous avons assumé la gestion entière de nombreuses stations, et avons étendu l'exploitation d'autres à l'année longue.

AIR QUALITY AND CLIMATE CHANGE RESEARCH AND MONITORING

Table 2 shows the 1998 and 2001 numbers for other air monitoring programmes and air research programmes. Like the weather station count, these are approximate numbers, but for a different reason. In this case it often happens that one programme overlaps two of the categories here, such as in the study of acidification effects on flora and fauna, or when deciding whether a stream water quality monitoring programme is indeed related to an air issue, or whether satellite monitoring of vegetation change is a climate change research programme, or linked to a basic understanding of vegetation extent and development regardless of anthropogenic climate change.

RECHERCHE ET SURVEILLANCE DE LA QUALITÉ DE L'AIR ET DU CHANGEMENT CLIMATIQUE

Le tableau 2 fait état des chiffres pour 1998 et 2001 concernant d'autres programmes de surveillance atmosphérique et de programmes de recherche sur la qualité de l'air. Comme pour le nombre de stations météo, ce sont des chiffres approximatifs, mais pour une raison différente. Dans ce cas-ci, il arrive souvent qu'un programme chevauche deux des catégories mentionnées, comme pour l'étude des effets de l'acidification sur la flore et la faune, ou lorsqu'il s'agit de décider si un programme de surveillance de la qualité d'un cours d'eau se rattache effectivement à un enjeu atmosphérique, ou si la surveillance par satellite des changements de la végétation est un programme de recherche sur le changement climatique, ou lié à la connaissance fondamentale de l'étendue et du développement de la végétation, quels que soient les changements climatiques anthropogènes.

Table 2. Air quality research and monitoring[1]

Category	Examples	1998	2001
Acidification	Acid deposition direct measures, acidification of surface waters, biotic responses to acidification	15	10
Other pollutants	Programmes including ambient and deposition measures of air pollutants, e.g. ozone, particulate.	31	27
Biotic responses	Programmes looking at pollutant levels in organisms without measuring ambient levels or deposition rates	12	19
Climate change	Includes satellite image monitoring of snow cover, phenology, ice watch, etc.	8	24
Other	Includes avalanche climatology, glaciology, atmosphere and ecosystem interactions, microclimate studies, etc.	4	6
	Total	**70**	**86**
None	Parks with weather stations but no other air science programmes - double check from met station update	9	7
	Parks with neither air science studies nor weather stations	2	1
	Total	**11**	**8**

1. This table shows the number of air issue-related programmes or projects taking place within national park boundaries, whether or not Parks Canada is a participant.

Tableau 2. Recherche et surveillance de la qualité de l'air[1]

Catégorie	Exemples	1998	2001
Acidification	Mesures directes des dépôts acides, acidification des eaux de surface, réponses biotiques à l'acidification	15	10
Autres polluants	Programmes comprenant des mesures des polluants atmosphériques ambiants et déposés, par exemple l'ozone, les matières en suspension	31	27
Réponses biotiques	Programmes examinant les niveaux de polluants dans les organismes, sans mesurer les niveaux ambiants ou les taux de dépôts	12	19
Changement climatique	Comprend la surveillance par image satellite de l'enneigement, de la phénologie, des glaces, etc.	8	24
Autres	Comprend la climatologie des avalanches, la glaciologie, les interactions de l'atmosphère et des écosystèmes, les études de microclimats, etc.	4	6
	Total	**70**	**86**
Aucune	Parcs avec des stations météo mais aucun autre programme de science atmosphérique - double vérification par la mise à jour des stations météo	9	7
	Parcs sans études en sciences atmosphériques et sans stations météo	2	1
	Total	**11**	**8**

1. Ce tableau montre le nombre de programmes ou de projets ayant trait aux enjeux atmosphériques se déroulant à l'intérieur des limites des parcs nationaux, que Parcs Canada y participe ou non.

Nevertheless, the numbers in Table 2 are probably good to within 10% by category and 5% for the total. Full details, park-by-park, can be inspected in Appendix 3.

Malgré cela, les chiffres du tableau 2 sont probablement exacts dans une fourchette de 10 % par catégorie, et de 5 % pour le

Interestingly, and perhaps appropriate for an ecosystem management organization, programmes that measure air quality and pollutant deposition directly have decreased in number since 1998, whereas those that look at the effects of air quality and climate change have increased markedly. Most programmes that measure air quality and pollutant deposition directly are conducted by other agencies such as Environment Canada and universities. The decline in such monitoring reflects national trends in reduction of budgets for monitoring coupled with increasing scientific confidence in interpolation between stations and improved regional modelling of pollution flows. On the other hand, the increase in effects monitoring reflects the growth of applied sciences in Parks Canada to support ecological integrity programmes. It also stems from resource managers' increased awareness of air issues, such as climate change and persistent organochlorine pesticides, based on internal communications such as the electronic Air Issues Bulletin (Welch, 1996-2002) and the report commissioned by Parks Canada on the effects of climate change on the national park system (Scott and Suffling, 2000). For example, many of the northern national parks now track vegetation response to climate change using satellite images.

total. Les détails complets parc par parc peuvent être consultés à l'annexe 3.

Il est intéressant, et peut-être approprié pour une organisation de gestion de l'écosystème, de constater que les programmes qui mesurent directement la qualité de l'air et les dépôts de polluants ont diminué en nombre depuis 1998, alors que ceux qui examinent les effets de la qualité de l'air et du changement climatique ont augmenté de façon marquée. La plupart des programmes qui mesurent directement la qualité de l'air et les dépôts de polluants sont menés par d'autres agences, comme Environnement Canada et les universités. La diminution de cette surveillance reflète des tendances nationales de réduction des budgets consacrés à la surveillance, en même temps qu'une confiance scientifique accrue dans l'interpolation entre les stations et la modélisation régionale améliorée des flux de pollution. Par ailleurs, l'augmentation de la surveillance des effets reflète la croissance des sciences appliquées à Parcs Canada à l'appui des programmes d'intégrité écologique. Elle vient aussi de la conscience accrue qu'ont les gestionnaires des ressources des enjeux atmosphériques, comme le changement du climat et les pesticides organochlorés persistants, d'après des communications internes comme le Bulletin électronique des enjeux atmosphériques (Welch, 1996-2002) et le rapport commandé par Parcs Canada sur les effets du changement climatique sur le réseau des parcs nationaux (Scott et Suffling, 2000). Par exemple, un bon nombre des parcs nationaux nordiques surveillent maintenant les réactions de la végétation au changement climatique à l'aide d'images satellites.

INTERPRETATION AND OUTREACH

These activities include pamphlets and presentations to park visitors on weather hazards such as violent winds in Auyuittuq National Park, local air quality issues such as natural hydrogen sulphide venting at the hot springs in Banff National Park, local newspaper articles on UV and acidification prepared by Bruce Peninsula interpreters, and displays and signs in parks and communities about air monitoring instruments or air quality impacts. Even in parks that have no formal interpretation or outreach programme, interpreters and wardens are aware of the issues and explain them to enquiring visitors. Whereas weather and climate, air quality and climate change monitoring and research underwent significant increases between 1998 and 2001, interpretation and outreach programmes and outputs have seen no change, with a majority of parks providing neither in relation to air issues (Table 3).

There has been a doubling of in-house, staff training in air issues, but this probably reflects a corporate trend to increase staff awareness of all ecological integrity issues.

INTERPRÉTATION ET DIFFUSION EXTERNE

Ces activités comprennent les brochures et les présentations aux visiteurs des parcs concernant les incidents météorologiques comme les vents violents dans le parc national Auyuittuq, les enjeux atmosphériques locaux comme l'émission naturelle de sulfure d'hydrogène aux sources chaudes du parc national Banff, les articles de journaux locaux sur les UV et l'acidification préparés par les interprètes à la péninsule Bruce, et les expositions et les panneaux dans les parcs et les communautés au sujet des instruments de surveillance atmosphérique ou des impacts sur la qualité de l'air. Même dans les parcs qui n'ont pas de programmes officiels d'interprétation ou de diffusion externe, les interprètes et les gardes de parcs sont au courant des enjeux et les expliquent aux visiteurs intéressés. Alors que la surveillance et la recherche en météorologie et climatologie, qualité de l'air et changement climatique ont augmenté de façon importante entre 1998 et 2001, les programmes et produits d'interprétation et de diffusion n'ont pas connu de changement, la majorité des parcs ne présentant rien par rapport aux enjeux atmosphériques (tableau 3).

La formation interne du personnel en matière d'enjeux atmosphériques a doublé, mais cela reflète probablement une tendance de l'organisation à mieux informer le personnel au sujet de toutes les questions d'intégrité écologique.

Table 3. Interpretation, outreach and staff training products and activities[1, 2]

Category	Interpretation	Outreach	Parks with neither	Staff training	Parks with no staff training	Total activity
1998	32	7	20	4	39	43
2001	33	7	20	8	36	48

1. This table shows the number of programmes or products delivered by Parks Canada, whether in park boundaries or not, or whether in Parks Canada publications or not.
2. In July 2001, after receipts of returns from the Atlantic region, an air issues pamphlet was produced by the Northeast Regional Air Quality Committee and distributed in bulk to the seven Atlantic national parks. This addition would raise the number of air issue interpretation programmes to 40 and reduce the number of parks with neither air issues interpretation nor air issues outreach to 17.

Tableau 3. Produits et activités d'interprétation, de diffusion externe et de formation du personnel[1, 2]

Catégorie	Interprétation	Diffusion externe	Parcs sans l'une ni l'autre	Formation du personnel	Parcs sans formation du personnel	Total des activités
1998	32	7	20	4	39	43
2001	33	7	20	8	36	48

1. Ce tableau montre le nombre de programmes ou de produits fournis par Parcs Canada, que ce soit à l'intérieur des limites des parcs ou non, ou que ce soit dans des publications de Parcs Canada ou non.
2. En juillet 2001, après réception de résultats pour la région de l'Atlantique, une brochure sur les enjeux atmosphériques a été produite par le Northeast Regional Air Quality Committee et distribuée en vrac aux sept parcs nationaux de l'Atlantique. Cet ajout ferait grimper le nombre de programmes d'interprétation des enjeux atmosphériques à 40, et réduirait le nombre de parcs sans interprétation des enjeux atmosphériques et sans diffusion au sujet des enjeux atmosphériques à 17.

AIR ISSUES

I assigned each air issue identified by a park to one of the categories in Table 4. Usually this was a clear fit, but some cases were ambiguous, as when a correspondent refers to "long range transport of air pollution" in the context of acidification. Similarly, "smog" can refer either to local sources of fine particulate from domestic wood fires and forest slash burning, or to ground-level ozone and its precursor emissions of nitrate and sulphate from vehicular and industrial combustion transported downwind from large urban centres. However, the same ambiguities applied in the 1998 survey, so we can see some real trends in the data.

ENJEUX ATMOSPHÉRIQUES

J'ai placé chacun des enjeux atmosphériques identifiés par un parc dans l'une des catégories du tableau 4. Il s'agissait généralement d'une correspondance manifeste, mais certains cas étaient ambigus, comme lorsqu'un correspondant parle du « transport à grande distance des polluants atmosphériques » dans le contexte de l'acidification. De même, le terme « smog » peut se rapporter aux sources locales de fines matières en suspension provenant de feux de bois domestiques et du brûlage de déchets forestiers, ou à l'ozone au niveau du sol et aux émissions de polluants précurseurs de nitrates et de sulfates provenant des moteurs et de la

Table 4. Air issues[1]

Issues reported	In management documents 1998	In management documents 2001	Other 1998	Other 2001	Total 1998	Total 2001
Parks reporting: 1998 = 38 park, 2 marine parks, 1 site, 1 land withdrawal 2001 = 39 national parks, 2 marine parks					42	41
Climate change, global warming	20	23	3	6	23	29
Undifferentiated air pollution, long range transport	12	17	5	7	17	24
Stratospheric ozone depletion, UV-B	3	3	14	11	17	14
Particulate and smoke from transport, fires, heating	7	5	5	5	12	10
Acid deposition, acid rain and fog	8	5	2	4	10	9
Toxics - mercury, organochlorines, other pesticides	7	5	2	3	9	8
Visibility, Arctic haze	2	2	3	2	5	4
Enrichment - industrial & agricultural nitrates, phosphates	0	3	1	0	1	3
Noise (aircraft), light (night sky)	0	1	3	2	3	3
Ground-level ozone	2	1	2	1	4	2
The most issues reported by one park					6	6
Parks with at least one air issue in management documents					33	34
Other parks with at least one other air issue					3	4
Parks with no air issues					6	3

1. This table shows the number of national and marine parks reporting each issue.

Tableau 4. Enjeux atmosphériques[1]

Enjeux signalés	Dans les documents de gestion 1998	Dans les documents de gestion 2001	Autres 1998	Autres 2001	Total 1998	Total 2001
Parcs faisant rapport : 1998 = 38 parcs, 2 parcs marins, 1 lieu, 1 mise en réserve 2001 = 39 parcs nationaux, 2 parcs marins					42	41
Changement climatique, réchauffement du globe	20	23	3	6	23	29
Pollution atmosphérique indifférenciée, transport à grande distance	12	17	5	7	17	24
Appauvrissement de l'ozone stratosphérique, UV-B	3	3	14	11	17	14
Matières en suspension et fumée des transports, des feux, du chauffage	7	5	5	5	12	10
Dépôts acides, pluie acide et brouillard	8	5	2	4	10	9
Produits toxiques - mercure, organochlorés, autres pesticides	7	5	2	3	9	8
Visibilité, brume arctique	2	2	3	2	5	4
Enrichissement - nitrates, phosphates industriels et agricoles	0	3	1	0	1	3
Bruit (aéronef), lumière (ciel nocturne)	0	1	3	2	3	3
Ozone au niveau du sol	2	1	2	1	4	2
Le plus grand nombre d'enjeux signalés par un parc					6	6
Parcs faisant état d'au moins un enjeu atmosphérique dans les documents de gestion					33	34
Autres parcs avec au moins un autre enjeu atmosphérique					3	4
Parcs sans enjeux atmosphériques					6	3

1. Ce tableau montre le nombre de parcs nationaux et de parcs marins signalant chacun des enjeux.

combustion industrielle et transportés sous le vent des grands centres urbains. Mais les mêmes ambiguïtés s'appliquent à l'étude de 1998, et nous pouvons donc déduire des données quelques tendances réelles.

Climate change remains the leading air issue. Indeed, it has risen in prominence, to the extent that it is recognized as an issue by three-quarters of the parks, and is addressed in some way in the management documents of over half the park. This may be a reflection of 1) the frequent publicity about climate change in the media, 2) the impact of the climate change screening assessment commissioned by Parks Canada, the report of which was sent to each park in 2000 (Scott and Suffling, 2000), 3) local observations of environmental change that can be ascribed to climate change, such as melting permafrost, increased drought and direct recording of record warm temperatures, or, more likely, all of the above. Undifferentiated air pollution has also become more recognized, perhaps as a result of the internal communications relating to air issues. While there is little direct measurement of air quality at the field level, this is a major knowledge gap that would be expensive to fill.

Le changement climatique demeure l'enjeu atmosphérique principal. Il a même gagné en importance, au point où c'est un enjeu reconnu par les trois quarts des parcs, qui y est abordé d'une façon ou d'une autre dans les documents de gestion de plus de la moitié des parcs. Il peut s'agit là d'un effet 1) de la publicité fréquente au sujet du changement climatique dans les médias, 2) de l'impact de l'évaluation du changement climatique commandée par Parcs Canada, dont le rapport a été envoyé à chacun des parcs en 2000 (Scott et Suffling, 2000), 3) des observations locales de changements de l'environnement qui peuvent être attribués aux changements climatiques, comme la fonte du pergélisol, une plus grande sécheresse et l'enregistrement direct de températures élevées records, ou plus probablement, tout ce qui précède. La pollution atmosphérique indifférenciée est également mieux reconnue, peut-être à la suite des communications internes traitant des enjeux atmosphériques. Il y a peu de mesures directes de la qualité atmosphérique sur le terrain, mais il s'agit là d'une importante lacune dans les connaissances qui serait coûteuse à combler.

The recognition of acidification, airborne toxics and visibility impairment has remained relatively constant, while that of ground-level ozone augmentation and stratospheric ozone depletion has abated somewhat.

La place faite à l'acidification, aux substances toxiques aéroportées, et à la diminution de la visibilité est demeurée relativement constante, alors que celle de l'augmentation de l'ozone au niveau du sol

This may reflect the understanding that show that ground-level ozone damage is transitory if smog events are only episodic, and that smog abatement measures in the northeast United States are resulting in improvement compared to the smoggy years of the 1980s. There is also much less direct evidence of damage to organisms caused by increased UV-B compared to the damages due to many other air issues, such as mercury transport, particulate and climate change. Overall, there has been no change in the extent to which park management documents reflect concern with air issues as an ensemble, although there are now only three parks where air issues are not recognized even at the informal level of the air issue contact person.

et de l'appauvrissement de l'ozone stratosphérique a quelque peu diminué.

Cela peut être dû aux connaissances qui montrent que les dommages à l'ozone au niveau du sol sont passagers si les occurrences de smog ne sont qu'épisodiques, et que les mesures de réduction du smog dans le nord-est des États-Unis apportent des améliorations comparativement aux années 80 embrumées. Il y a également beaucoup moins de preuves directes de dommages aux organismes causés par une augmentation des UV-B comparativement aux dommages résultant de bien d'autres enjeux atmosphériques, comme le transport de mercure, les matières en suspension et le changement climatique. Dans l'ensemble, il n'y a pas eu de changement dans la place faite aux préoccupations concernant les enjeux atmosphériques dans les documents de gestion des parcs en général, bien qu'il ne reste plus que trois parcs où les enjeux atmosphériques ne sont pas reconnus même au niveau informel de la personne-ressource pour les enjeux atmosphériques.

LOCAL AIR POLLUTION SOURCES

The dominant air issues at most parks are global and continental scale phenomena, like climate change, acid deposition, UV-B and long range transport of organochlorines. Nevertheless, there are local and regional air issues that affect park values and visitor satisfaction. While Parks Canada may have little direct influence upon the wider scale issues, there is scope for tackling some of these local issues through its own actions or

SOURCES LOCALES DE POLLUTION ATMOSPHÉRIQUE

Les enjeux atmosphériques dominants dans la plupart des parcs sont des phénomènes à l'échelle du globe et du continent, comme le changement climatique, les dépôts acides, les UV-B et le transport à grande distance des organochlorés. Il y a cependant des enjeux atmosphériques locaux et régionaux qui touchent les valeurs des parcs et la satisfaction des visiteurs. Parcs Canada peut n'avoir qu'une influence directe

through partnership and persuasion with local and regional stakeholders. As well, efforts to solve such issues help reinforce park messages about the need for the wider population, in Canada and elsewhere, to think about and act upon anthropogenic disturbances to the atmosphere.

réduite sur les enjeux à grande échelle, mais il y a des moyens pour s'attaquer à quelques-uns des enjeux locaux soit par ses propres actions, soit par des partenariats et par la persuasion d'intervenants locaux et régionaux. Par ailleurs, les efforts pour résoudre de tels enjeux atmosphériques aident à renforcer les messages des parcs au sujet de la nécessité pour la population dans son ensemble, au Canada comme ailleurs, de réfléchir aux perturbations anthropogéniques de l'atmosphère et de passer à l'action dans ce domaine.

Each national park air issues contact was asked to list the major air pollution sources within the park's greater ecosystem and airshed. They were asked not to include continental or global air pollution sources with general titles, like "urban transportation" or "industrial emission," but to specify local sources like railway yards, smelters, petrochemical plants, or pesticides from neighbouring farmland. Such local sources could be town sites within parks or at boundaries, through transportation corridors, and urban areas or factories close enough for smog events to have a same-day manifestation within the park. Correspondents were asked to consider more than just chemical pollution, but to think about noise and light pollution, particulate matter and odours. The results are shown in Table 5.

On a demandé à chacune des personnes-ressources pour les enjeux atmosphériques dans les parcs de dresser la liste des principales sources de pollution atmosphérique dans le grand écosystème du parc et dans son bassin atmosphérique. On leur a demandé de ne pas inclure des sources de pollution atmosphérique continentales ou mondiales avec des titres généraux comme « transports urbains » ou « émissions industrielles », mais de préciser les sources locales, comme les gares de triage, les fonderies, les usines pétrochimiques ou les pesticides provenant des terres agricoles environnementales. Ces sources locales peuvent se trouver dans les lotissements urbains à l'intérieur des parcs ou sur leurs limites, dans des corridors de transport, et dans des zones urbaines ou des usines assez proches pour que les occurrences de smog se manifestent le jour même dans le parc. On a demandé aux correspondants de ne pas se limiter à la pollution chimique, mais de penser également à la pollution par le bruit et par la lumière, par les matières en suspension et par les odeurs. Les résultats apparaissent au tableau 5.

Table 5. Local air pollution sources

Parks reporting	1998	2001
The most sources reported by a park (2 parks in 1998, 3 in 2001)	5	6
Parks reporting no local sources	12	11
Parks reporting at least one in-park source, none outside	6	8
Parks reporting at least one external source, none inside	18	9
Parks reporting at least one inside and at least one outside	6	13
Sources related to visitor activities		
Smoke from campgrounds	4	5
Automobile, boat and train emissions	6	8
Sources related to communities and through traffic		
All vehicular emissions from town sites and through traffic	6	10
Electricity generator for community outside park	3	5
Domestic fires, grounds keeping, e.g. small engine emissions	2	5
Smoke and odour from landfill sites	2	9
Smog from a nearby large urban centre	1	6
Aircraft overflights	2	2
Sources related to external resource management and production		
Enrichment from agriculture fertilizers and dust from low reservoirs	1	6
Pesticides from agriculture	5	7
Pesticides from forestry	1	1
Biomass burning, e.g. prescribed burns, slash burning	5	7
Particulate from peat harvesting	1	0
Industrial odours, e.g. from pulp mills, fish processing plants	3	3
Industrial smoke and other particulate, e.g. from refineries	16	23

1. This table shows the number of national and marine parks reporting each type air pollution source within the park or regional air shed.

Tableau 5. Sources locales de pollution atmosphérique

Parcs faisant rapport	1998	2001
Le plus grand nombre de sources signalées par un parc (2 parcs en 1998, 3 en 2001)	5	6
Parcs ne signalant pas de sources locales	12	11
Parcs signalant au moins une source dans le parc, aucune à l'extérieur	6	8
Parcs signalant au moins une source externe, aucune à l'intérieur	18	9
Parcs signalant au moins une source à l'intérieur et au moins une source à l'extérieur	6	13
Sources liées aux activités des visiteurs		
Fumée des campings	4	5
Émissions des automobiles, des bateaux et des trains	6	8
Sources liées aux communautés et au trafic de transit		
Toutes les émissions des véhicules produites dans les lotissements urbains et par le trafic de transit	6	10
Production d'électricité pour les communautés à l'extérieur des parcs	3	5
Feux domestiques, entretien des terrains, par exemple émissions des petits moteurs	2	5
Fumée et odeurs des décharges	2	9
Smog provenant d'un grand centre urbain à proximité	1	6
Survols des avions	2	2
Sources liées à la gestion et à la production de ressources externes		
Enrichissement provenant de fertilisants agricoles et poussière des réservoirs à faible niveau	1	6
Pesticides provenant de l'agriculture	5	7
Pesticides provenant de la foresterie	1	1
Brûlage de la biomasse, par exemple brûlages dirigés, brûlages de déchets forestiers	5	7
Matières en suspension provenant de l'extraction de la tourbe	1	0
Odeurs industrielles, par exemple des usines de pâte à papier, des usines de transformation du poisson	3	3
Fumée industrielle et autres matières en suspension, par exemple des raffineries	16	23

1. Ce tableau montre le nombre de parcs nationaux et de parcs marins signalant chaque type de source de pollution atmosphérique dans le parc ou dans le bassin atmosphérique régional.

Three quarters of all parks reported at least one local source of air pollution which the correspondent believed to be significant for concern or further investigation. Industrial activities in the air shed, such as petrochemical or mineral refineries, lead the pack of concerns by a clear nose. A prime example of this is the complex of refineries at Fort Saskatchewan, west and

Les trois quarts de tous les parcs ont signalé au moins une source locale de pollution atmosphérique jugée suffisamment importante pour le correspondant pour s'en préoccuper ou faire enquête. Les activités industrielles dans le bassin atmosphérique, comme les usines de traitement des produits pétrochimiques ou minéraux, se situaient

upwind of Elk Island National Park. In this case, the park has entered into a regional clean air partnership, one that includes some of the energy companies, to study and abate the transport of particulate and nitrates into the park and surrounding countryside.

clairement en tête du peloton. Le complexe de raffineries à Fort Saskatchewan, à l'ouest et dans le vent du parc national Elk Island, en constitue un excellent exemple. En l'occurrence, le parc s'est joint à un partenariat régional de lutte contre la pollution atmosphérique, un partenariat qui comprend quelques-unes des sociétés d'énergie, afin d'étudier et de réduire le transport de matières en suspension et de nitrates dans le parc et les terres environnantes.

National parks are not immune from generating their own air pollution, witness the second leading group of concerns about the potential for air pollution from traffic in park town sites and along through transportation corridors. For example, several correspondents have reported anecdotes about the fumes from idling tour buses at visitor hot spots. Campground smoke has also been studied at Jasper, Kouchibouguac and Forillon National Parks. Particulate and benzene compounds can reach high levels when temperature inversions coincide with evenings during peak visitor periods, when many campers like to cook at and sit around a campfire.

Les parcs nationaux produisent parfois leur propre pollution atmosphérique, comme le montre le deuxième groupe de préoccupations concernant le potentiel de pollution atmosphérique par le trafic dans les lotissements urbains des parcs et le long des corridors de transit. Quelques correspondants par exemple ont fait état des émanations des autocars tournant au ralenti dans les endroits très fréquentés par les touristes. La fumée des campings a également été étudiée dans les parcs nationaux Jasper, Kouchibouguac et Forillon. Les matières en suspension et les composés de benzène peuvent atteindre des niveaux élevés lorsque des inversions de température coïncident avec les soirées de la haute saison, alors que les campeurs aiment cuisiner sur un feu de camp et s'attarder autour.

External non-point pollution sources are the other general category of local and regional air pollution sources, such as slash and stubble burning by neighbouring forest managers and farmers, and the regional smog and haze from metropolitan areas that affects southern Ontario, the Bay of Fundy region and, sometimes, the greater Calgary region. Curiously, while

Les sources diffuses extérieures de pollution entrent dans l'autre catégorie générale de sources locales et régionales de pollution atmosphérique, comme les brûlages de déchets forestiers et autres par les gestionnaires forestiers et les fermiers des environs, et le smog et la brume de caractère régional provenant des zones métropolitaines et qui affectent le sud de

six parks now identify urban smog as a local pollution issue, only two report ground-level ozone as a significant air issue.

AIR ISSUE RELATED VALUES

The 1998 and 2001 surveys asked for the air issues and related values referred to in park management documents, other issues and values that the field unit air issues contacts thought were important, and important park values that might be related to air issues. Table 6 is a summary of the air related values drawn from the answers and the free comments of correspondents. Given that "air issue related values" is a relatively new concept, it is not surprising that the answers were conceived in widely diverging ways, so a rigorous summary would be premature. The answers came in overlapping terms, such as vegetation productivity and succession on the one hand versus aquatic habitat on the other, and they came in varying degrees of specificity, such as raptors versus piscivorous waterfowl versus eagles and loons. Some issues were raised without stating the values related to them, most commonly global change, Arctic haze and undifferentiated air pollution. I did not insert my judgement in these cases. For all these reasons, I have not counted or ranked frequencies. So while many individual park statements are quite specific, I feel that a roll-up must be limited to a scoping exercise. Space does not permit me to list

l'Ontario, la région de la baie de Fundy, et parfois la grande région de Calgary. Curieusement, alors que six parcs identifient maintenant le smog urbain comme un enjeu local de pollution, seulement deux parcs signalent l'ozone au niveau du sol comme un enjeu atmosphérique important.

VALEURS LIÉES AUX ENJEUX ATMOSPHÉRIQUES

Les enquêtes de 1998 et de 2001 ont cherché des renseignements au sujet des enjeux atmosphériques et des valeurs connexes mentionnés dans les documents de gestion des parcs, d'autres enjeux et valeurs considérés comme importants par les personnes-ressources des unités de gestion pour les enjeux atmosphériques, et les valeurs importantes des parcs qui pourraient être liées aux enjeux atmosphériques. Le tableau 6 est un résumé des valeurs liées aux enjeux atmosphériques, tiré des réponses et des commentaires libres des correspondants. Comme les « valeurs liées aux enjeux atmosphériques » forment un concept relativement nouveau, il n'est pas surprenant que les réponses aient pris des formes très différentes, de sorte qu'il serait prématuré de vouloir établir un sommaire rigoureux. Les réponses se chevauchaient, par exemple d'une part la productivité et la succession de la végétation et d'autre part l'habitat aquatique, et elles prenaient différents degrés de spécificité, comme les rapaces versus les oiseaux aquatiques piscivores versus les aigles et les huards. Certains enjeux ont été mentionnés sans les valeurs connexes, le plus communément le changement global, la brume arctique, et la pollution atmosphérique diffuse. Dans de tels cas,

the air issues related to each of these values, but climate change, acidification,

Table 6. Air issue related values[1, 2]

General environments and processes	
Ecosystems	General, unspecified impacts on ecosystems and their integrity
Terrestrial systems	Fire regime; habitat distribution and quality; plant productivity, decomposition, succession and composition, *old growth forest, rare vascular plants*
Aquatic systems	Ecosystem functions, fish populations, habitats, productivity, *cold water species*
Marine	*Intertidal zones, sea level, currents, bergs, ocean ecology*
Cold systems	Lakes dynamics, permafrost, tundra, *late snow bed communities, endemic plants in refugia*
Specific environmental categories	
Landforms	Glaciers, permafrost, shorelines (erosion), *rock and mud slides, sand dunes*
Soils	Unspecified, mostly related to acidification and moisture regime change
Water	Lake and river regime, water quality, temperature, ice climate
Specified flora	*White* birch, lichen, *red* maple, *white and pitch* pine, *mosses*, rare and sensitive plants
Mammals	Caribou, grizzly bears, polar bears, *wolves, white-tailed deer, elk, Arctic hare, moose, harbour and grey* seals, unspecified piscivorous mammals
Birds	Eagles, peregrine falcons, *osprey*, great blue herons, *terns, rea-throated* loons, mergansers, Piping plover, *rock ptarmigan*
Fish	*Atlantic salmon, Arctic char, brook trout*
Other fauna	Amphibians, diatoms, insects, salamanders
Other organisms	Unspecified plankta and soil organisms
Human categories	
Cultural resources	*Archeological remains*, petroglyphs
Traditional activities	Unspecified
Health	Particulate - respiration, highway safety; *UV-B - sunburns, cataracts, cancers; toxics in country food; ice crossings (safety issues)*
Amenity	Aesthetics, visibility and vistas (including night sky); expectations of clean, fresh air

1. This table gives representative examples of the air issue related values identified by correspondents in 1998 and 2001.
2. 2001 additions are italicised.

Tableau 6. Valeurs liées aux enjeux atmosphériques[1, 2]

Environnements et processus généraux	
Écosystèmes	Impacts généraux non spécifiés sur les écosystèmes et leur intégrité
Systèmes terrestres	Régime d'inflammabilité; distribution et qualité de l'habitat; productivité, décomposition, succession et composition des végétaux, *forêts anciennes, plantes vasculaires rares*
Systèmes aquatiques	Fonctions écosystémiques, populations halieutiques, habitats, productivité, *espèces propres aux eaux froides*
Marine	*Zones intertidales, niveau de la mer, courants, icebergs, écologie océanique*
Systèmes froids	Dynamique des lacs, pergélisol, toundra, *communautés d'enneigement tardif et plantes endémiques des refuges*
Catégories environnementales spécifiques	
Reliefs	Glaciers, pergélisol, rivages (érosion), *glissements de roches et de boue, dunes de sable*
Sols	Non spécifiés, généralement liés à l'acidification et au changement du régime d'humidité
Eau	Régime des lacs et des rivières, qualité de l'eau, température, climatologie des glaces
Flore spécifiée	*Bouleau blanc*, lichen, érable *rouge*, pin *blanc* et pin *rigide*, *mousses*, plantes rares et délicates
Mammifères	Caribous, ours grizzlys, ours polaires, *loups, cerfs de Virginie, wapitis, lièvres arctiques, orignaux*, phoques *communs* et phoques *gris*, mammifères piscivores non spécifiés
Oiseaux	Aigles, faucons pèlerins, *balbuzards*, grands hérons, *sternes*, huards *à gorge rousse*, becs-scies, pluviers siffleurs, *lagopèdes des rochers*
Poissons	*Saumons de l'Atlantique, ombles chevaliers, ombles de fontaine*
Autre faune	Amphibiens, diatomées, insectes, salamandres
Autres organismes	Planctons et organismes du sol non spécifiés
Catégories humaines	
Ressources culturelles	*Vestiges archéologiques*, pétroglyphes
Activités traditionnelles	Non spécifiées
Santé	Matières en suspension - respiration, sécurité routière; *UV-B - coups de soleil, cataractes, cancers; produits toxiques dans la nourriture traditionnelle; traverses de glace (enjeux de sécurité)*
Agréments	Critères esthétiques, visibilité et perspectives (notamment le ciel nocturne); attentes en matière d'air pur et frais

1. Ce tableau donne des exemples représentatifs des valeurs liées aux enjeux atmosphériques identifiées par les correspondants en 1998 et en 2001.
2. Les ajouts de 2001 sont en italique.

UV-B and long range transport of undifferentiated air pollutants are the most commonly mentioned.

je n'ai pas fait intervenir mon propre jugement. Pour toutes ces raisons, je n'ai pas compté ou hiérarchisé les fréquences. Les déclarations de nombreux parcs sont

DISCUSSION AND CONCLUSIONS

The two questionnaires illustrate a widespread and slowly growing awareness and concern among national park staff about air issues. Based on many conversations and e-mails, I believe that part of this is due to air issues events at park science conferences (e.g. Munro and Willison 1998, Visconti, Beniston et al 2001) and the Air Issues Bulletin (Welch 1996-2002). It is probably also due to the broader effort to define and measure ecological integrity as an accountability measure for park management. Much is also due to the rapidly growing public and media awareness of air issues, particularly climate change, smog and UV-B.

Given this increased awareness, it is therefore somewhat discouraging that there has been a reduction in the number of programmes conducted within national parks that measure air pollution directly. This reflects a reduction in the air quality monitoring intensity conducted by other

donc tout à fait spécifiques, mais je crois qu'une synthèse doit se limiter à un exercice d'établissement de la portée de l'évaluation. L'espace disponible ne me permet pas de dresser la liste des enjeux atmosphériques liés à chacune de ces valeurs, mais les plus couramment mentionnés sont le changement climatique, l'acidification, les UV-B, et le transport à grande distance des polluants atmosphériques diffus.

DISCUSSION ET CONCLUSIONS

Les résultats des deux questionnaires montrent une prise de conscience et un intérêt largement répandu et croissant chez le personnel des parcs nationaux au sujet des enjeux atmosphériques. En me fondant sur de nombreuses conversations et les courriels reçus, je crois que ceci est dû en partie à l'attention consacrée aux enjeux atmosphériques lors de conférences sur la science dans les parcs (par exemple Munro et Willison 1998, Visconti, Beniston *et al.* 2001) et au Bulletin sur les enjeux atmosphériques (Welch 1996-2002). C'est probablement aussi le résultat d'un effort plus large visant à définir et à mesurer l'intégrité écologique comme mesure de reddition des comptes en matière de gestion des parcs. De plus, le public et les médias accordent beaucoup plus d'attention aux enjeux atmosphériques, particulièrement au changement climatique, au smog et aux UV-B.

Compte tenu de cet intérêt accru, il est quelque peu décourageant de constater qu'il y a eu une diminution du nombre de programmes menés dans les parcs nationaux pour mesurer la pollution atmosphérique de façon directe. Cela traduit une diminution de l'intensité de la

agencies, since Parks Canada is typically a host for such stations rather than a sponsor. On the other hand, there has been a greater increase in the number of programmes looking at the biotic responses to air pollution and climate change. There has also been a large increase in the number of weather and climate stations operated by Parks Canada in or near national parks. This reflects the conjunction of two factors, an increased focus on the need to study and understand ecological integrity and associated processes, and an increased availability of affordable automatic weather stations.

surveillance de la qualité de l'air faite par d'autres agences, puisque Parcs Canada est en règle générale l'hôte de ces stations plutôt que le commanditaire. D'un autre côté, il y a eu une augmentation du nombre de programmes portant sur les réponses biotiques à la pollution atmosphérique et au changement climatique. Il y a également eu une augmentation considérable du nombre de stations météorologiques et climatologiques exploitées par Parcs Canada dans les parcs nationaux ou à proximité. C'est le résultat d'une combinaison de deux facteurs : l'accent accru placé sur la nécessité d'étudier et de comprendre l'intégrité écologique et les processus connexes, et la plus grande accessibilité de stations météo automatiques d'un coût abordable.

The questionnaires show that the most prevalent air issues affecting national parks are perceived to be climate change, particulate matter, UV-B and airborne toxics. Because, in my view, the scientific literature has yet to show widespread, non-reversible damages to wild species populations and ecosystems (as opposed to human health) from mercury, ground-level ozone and UV-B, Parks Canada should concentrate on studying, reducing and adapting to climate change, particulate matter, persistent organochlorine pesticides and acid deposition. It should increase its interpretation and outreach activities in these topics, redouble its efforts under the sustainable development and environmental management systems to reduce air emissions from in-park town sites and traffic, and increase its regional partnership efforts to reduce air emissions from within park regions.

Les questionnaires montrent que les enjeux atmosphériques qui touchent le plus les parcs nationaux sont considérés être le changement climatique, les matières en suspension, les UV-B et les substances toxiques aéroportées. Comme à mon avis la littérature scientifique n'a pas encore démontré de dommages répandus et irréversibles aux populations d'espèces sauvages et aux écosystèmes (à la différence de la santé humaine) causés par le mercure, l'ozone au niveau du sol et les UV-B, Parcs Canada devrait s'attacher à étudier et à réduire le changement climatique, les matières en suspension, les pesticides organochlorés persistants et les dépôts acides et s'y adapter. L'organisation devrait accroître ses activités d'interprétation et de diffusion externe dans ces domaines, et redoubler ses efforts dans le cadre du développement durable et des systèmes de gestion environnementale afin de réduire les émissions atmosphériques produites par

les lotissements urbains et la circulation à l'intérieur des parcs, et augmenter ses efforts de partenariats régionaux afin de réduire les émissions atmosphériques dans les régions des parcs.

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APPENDIX 1

THE QUESTIONNAIRE AND ITS INSTRUCTIONS

Here are the English versions of the covering memorandum, accompanying instructions, the questionnaire itself, and the fictional example return that was also provided for further guidance. This is merged with the questionnaire form in this appendix.

MEMORANDUM

To: Air issues contact group
From: Director General, National Parks Directorate
Subject: Air issues questionnaire - 2001

Request/Summary. The enclosed seeks information for each national park and national marine conservation area (NMCA) concerning weather, climate and air quality monitoring and research, air issues, and park and NMCA values dependent on good quality air and a natural climate.

Background. This questionnaire is intended to update the one conducted in 1998, the results of which were summarized in several editions of the Air Issues Bulletin sent out by David Welch. The 1998 survey resulted in a contribution to the State of Protected Heritage Areas 1999 Report and to papers at park science conferences and workshops. It helped to frame recommendations to the Ecological Integrity Panel and to identify the need for the climate change study that received such media publicity when it was released last year. It also helped the national office to better reflect the interests of field units when participating in interdepartmental consultations and other government business.

Rationale. This new survey will provide an update about the state of air issues and air science at your park(s). As before, the results will contribute to state of protected heritage area reporting and to Parks Canada's interventions and presentations at air issues meetings of all kinds.

"First Priority," the progress report on implementing the recommendations of the Ecological Integrity Panel, affirms that Parks Canada seeks funds to develop an air quality monitoring programme in conjunction with the Meteorological Service of Canada (MSC). The report also affirms that Parks Canada seeks new memoranda of understanding (MOUs) with government science agencies. A comprehensive MOU with MSC would provide an improved basis for weather and air quality monitoring and air issues research in national parks. Your careful attention to this questionnaire will help Parks Canada to assess the current level of cooperation with MSC, what items should be covered in an MOU, what problems need resolution, and what funding would be needed.

Instructions for completing the questionnaire appear in the attached instructions and generic example files. Please complete and return the questionnaire by 30th June 2001 to David Welch, Ecological Integrity Branch.

Thanks in anticipation for your attention to this, and for the information that you provide.

Bruce Amos

INSTRUCTIONS

1. For brevity, the word "park" is used henceforth to indicate either an existing national park or an existing national marine conservation area.

2. If someone else in your park or field unit is better placed to be the air issues contact person and to provide this information, please pass this request to that person and notify David Welch of the change as soon as possible.

3. The English and French versions of the questionnaire are contained in the files *Air-q-english-questionnaire.wpd* and *Air-q-francais-questionnaire.wpd*. To explain and demonstrate how to complete the questionnaire, English and French fictional returns are attached as the files *Air-q-english-sample.wpd* and *Air-q-français-exemple.wpd*.

4. Two other files are attached to help you review and update your information. One is a compilation of all 1998-99 returns in the language submitted, *Air-q-bilingual-results-1998.wpd*. The other is the inventory of all Parks Canada weather stations prepared in 1999 by the national fire management unit, *Stations-fire-feux-1999.xls*.

5. The information is requested for **each park, not field unit**, so please duplicate the form as needed for each of the parks in your field unit. In the case of Banff, where two field units share the park, please coordinate with your counterpart to create a unified response for the park.

6. Several questions may have multiple answers, such as your list of air issues. In these cases, copy the headings as often as you need.

7. Use the comments section at the end to provide more information on any question or to address topics not covered in the questionnaire.

8. Return the information to David Welch by email as a WordPerfect document. Please contact him if you need more explanation.

Please send the information by internal email to:

David Welch, Physical Sciences Advisor
Ecological Integrity Branch, Parks Canada
25 Eddy Street, 4th floor
Hull, Québec K1A 0M5
T:(819)994-5532, F:(819)997-3380

Your cooperation for completing and returning this questionnaire by 30th June 2001 is greatly appreciated.

Thank you.

AIR ISSUES QUESTIONNAIRE - 2001, WITH INSTRUCTIONS AND FICTIONAL EXAMPLES

PART 1, IDENTIFICATION

PARK NAME . . . . . : Atlantis National Park

PERSON COMPLETING THE QUESTIONNAIRE
Name and title . . . . . : David Welch, Physical Sciences Advisor
Parks Canada unit . . . . . : Ecological Integrity Branch
Telephone . . . . . : 819-994-5532

PART 2, PROGRAMMES

MONITORING
Monitoring is the observation of phenomena in a way that: is ongoing; is repetitive; has a prearranged schedule in time; has a prearranged schedule in space; and has a methodology that allows the pooling of observations between stations, networks and programmes, and between old and new protocols.

Weather stations
Please take particular care to record all weather stations either in your park or parks, or outside the park(s) but for which Parks Canada is responsible. Include avalanche and fire weather stations.

Name ..... : Gulf Island
Location (decimal lat/long) . : 47.50 N, 62.50 W (works compound)
Type and duration ..... : Automatic, year-round
Properties reported ..... : Temperature, precipitation, wind speed and direction, relative humidity, radiation
Start date ..... : 1947
Agency ..... : Environment Canada
Type of Parks Canada support : Routine service, data transfer

Name ..... : Ice Highway
Location (decimal lat/long) . : 45.60 N, 62.75 W (Ice Station Zebra)
Type and duration ..... : Manual, fire weather, Spring and Summer
Properties reported ..... : Temperature, precipitation, wind speed and direction
Start date ..... : 1974
Agency ..... : Parks Canada
Type of Parks Canada support : Equipment purchase, routine service, data transfer

Other air monitoring stations or programmes
Include ongoing air-related programmes even if data are not collected annually, such as planned sampling every few years.

Programme or station type .. : Canadian Acid Precipitation Monitoring Network
Location ..... : Works compound
Properties reported ..... : Sulphate and nitrate wet deposition, pH of rain
Start date ..... : 1978
Agency(ies) ..... : Environment Canada, Natural Resources Canada, Univ. of Canada
Type of Parks Canada support : Protected site, power, communication lines, coordination

Programme or station type .. : Acid Rain National Early Warning System
Location ..... : Lower valley of the Laurentian Channel
Properties reported ..... : Growth, crown structure, crown density, foliage chemistry, tree condition, pests
Start date ..... : 1984
Agency(ies) ..... : Natural Resources Canada
Type of Parks Canada support : None

RESEARCH
Please identify air-related investigations completed since 1996 or in progress, and that are not monitoring.

Project ..... : Mercury in loons and fish
Location ..... : Lake Downpour
Purpose ..... : Loon and chick behavioural patterns and population trends in response to mercury levels measured in blood and feathers.
Start and end dates ..... : 1992- ongoing
Agency(ies) ..... : Environment Canada, University of Canada, Health Canada
Type of Parks Canada support : Logistics, field laboratory

Project ..... : Particulate matter and public health
Location ..... : Main campground
Purpose ..... : Assess airborne particulate from campgrounds and forest fires for its effects on visibility and public health
Start and end dates ..... : 1997-1999
Agency ..... : Provincial Ministry of Environment
Type of Parks Canada support : Instrument housing, weekly maintenance

INTERPRETATION AND OUTREACH
List air-related public communications and interactions distributed by the park, such as posters, pamphlets, booklets, displays, videos, interpretive walks and talks, etc.. Please include the authoring agency. If there are none, please indicate this.

1. Environment Canada poster on UV index
2. Health Canada fact sheet on smog, particulate and health hazards
3. Park slide show on amphibian decline and the global use of pesticides
4. Support for high school curriculum on climate change

PART 3, AIR ISSUES AND RELATED VALUES

To ensure a good perspective when completing this section, please refer to the air quality section of the State of Protected Heritage Areas 1999 Report and to your park(s) section in the 2000 report on Climate Change and Canada's national park system. If you don't have a copy of the first report you can download it from the Library/Reports page of the Parks Canada web site. The climate change report was sent last year to each field unit's superintendent and air issues contact. If you don't have a copy you can download it from http://www.msc-smc.ec.gc.ca/airg/research.htm, Environment Canada's Adaptation and Impacts Research Group.

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS
List the air issues expressed in park management documents such as the ecological integrity statement, park management plan, ecosystem conservation plan, environmental management system, fire management plans, interagency memoranda of agreement, or any other formal document that bears on park management.

Air issue ..... : Mercury
Values impacted now ..... : Sport fish, human consumption health advisory
Value(s) at risk ..... : Piscivorous waterfowl

Air issue ..... : Acid rain
Values impacted now ..... : All lake species
Value(s) at risk ..... : Red maples, milkweed, monarch butterflies

Air issue ..... : Global warming
Values impacted now ..... : Soil moisture stress in Spring; northward movement of cardinals
Value(s) at risk ..... : Permafrost, coastal lagoons and marshes, Piping Plover habitat

OTHER AIR ISSUES

Identify other air issues that you feel should be recognized.

Air issue ..... : Haze/smog
Values impacted now ..... : Health of visitors under aerobic activity
Value(s) at risk ..... : Lake Downpour and Tickle Pass panoramic viewpoints

Air issue ..... : Light pollution from or near town sites
Values impacted now ..... : Aurora viewing
Value at risk ..... : Constellation viewing

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Please list the major air pollution sources within the park's greater ecosystem and airshed. DO NOT list continental or global air pollution sources, like "urban transportation" or "industrial emission." DO list specific local sources like railway yards, smelters, petrochemical plants or pesticides from neighbouring farmland. Please repeat the headings as necessary.

Pollution type ..... : Odour, hydrogen sulphide from desulphurisation
Location of source ..... : Petrochemical complex 50 km east of the park
Frequency ..... : Once or twice a month

Pollution type ..... : Smoke, carbon dioxide and noise
Location of source ..... : Shipping yards in park town site
Frequency ..... : Daily, year-round

OTHER AIR ISSUE RELATED VALUES

Please list up to five specific park values that depend on good air quality or a natural climate for their existence or for visitor appreciation. DO NOT include generalities like "ecosystem integrity," "wildlife" or "productivity," but DO include particular species, communities, vistas, land forms, historic buildings or visitor activities. Your list may include values and issues identified above, but you also have the opportunity to identify, e.g., values that depend

on current good air quality, such as a famous vista or marble headstones not currently affected by acid rain.

Air issue related value ..... : 4-toed salamander
Air issue(s) ..... : Persistent organochlorine pesticides, ground-level ozone, UV-B

Air issue related value ..... : Aspen grove parkland
Air issue(s) ..... : Nitrogen enrichment from nitrate fertilizer drift, climate change

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COMMENTS

Please add any comments or anecdotes, as brief or as long as you wish. You might:

- give current examples of air pollution occurrences affecting the park;
- make a general statement of the regional air quality context;
- reproduce air-related section(s) from your park's ecological integrity statement;
- describe how air pollution or climate change is already impacting specific values;
- describe efforts to work with regional partners to study or improve air quality; and/or
- describe problems you have encountered with the operation of weather stations;
- Etc..

Atlantis National Park lies downwind of North American pollution emission source regions, and gets a relatively large deposition of airborne pollutants that impact lakes, streams and vegetation. The pollutants having the most significant impact are sulphates and nitrogen oxides. Since the park's geology, soils and water tend to be naturally acidic and poorly buffered, the cumulative effects of acid rain can be significant to aquatic and terrestrial ecosystems. The park also experiences occasional ground-level ozone events that lead to smog and visibility impairment, and provide a health hazard to visitors engaged in aerobic activity such as hiking at high elevations. Small patches of relict permafrost in bogs are at risk of melting if climate continues to warm, although there has not yet been a detectable change. High smoke levels around campgrounds during evenings in the peak visitor season used to be a breathing and highway visibility hazard, but the greatly reduced recreational burning of wood, following the switch to user-pay for campfire wood, has eliminated this problem.

The park is a focal point for atmospheric pollutant deposition research. Related research by a number of institutions, universities and government agencies plays an essential role in gaining a greater knowledge of the ecological responses to air quality and climate change. Notwithstanding the long-term support given to these programmes, on several occasions the park has had difficulty retrieving meteorological data collected by its own stations and transmitted to Environment Canada.

ANNEXE 2

LE QUESTIONNAIRE ET LES INSTRUCTIONS

Voici la version française de la note de service, des instructions et du questionnaire lui-même, ainsi que les résultats de l'exemple fictif fourni en guise d'explication supplémentaire. Ces documents sont combinés avec la formule du questionnaire dans cette annexe.

La note de service

À: Groupe ressource sur les enjeux atmosphériques
De: Directeur général, Direction générale des parcs nationaux
Objet: Questionnaire sur les enjeux atmosphériques

Demande/Résumé. Pour chaque parc national et aire marine nationale de conservation (AMNC), la pièce jointe vise à recueillir de l'information sur la surveillance et la recherche portant sur la température, le climat et la qualité de l'air, ainsi que sur les enjeux atmosphériques et sur toutes les ressources qui dépendent de la bonne qualité de l'air et d'un climat naturel dans les parcs et les AMNC.

Historique. Ce questionnaire vise à mettre à jour les résultats de 1998 qui furent résumés dans plusieurs numéros du Bulletin sur les enjeux atmosphériques distribué par David Welch. Le sondage de 1998 a servi au Rapport sur l'état des aires patrimoniales protégées -- 1999 et à des présentations lors de conférences et d'ateliers scientifiques sur les parcs. Il a permis de formuler des recommandations à la Commission sur l'intégrité écologique et de déterminer le besoin de l'étude sur le changement climatique dont on a tant parlé dans les médias lors de sa publication l'an dernier. Il a aussi permis au Bureau national de mieux refléter les intérêts des unités de gestion lors de sa participation à des consultations interministérielles et à d'autres travaux du gouvernement.

Justification. Ce nouveau sondage fournira une mise à jour de l'état des enjeux atmosphériques et de la science atmosphérique dans vos parcs. Une fois de plus, les résultats contribueront aux rapports sur l'état des aires patrimoniales protégées et aux interventions et aux présentations de Parcs Canada lors de diverses réunions sur les enjeux atmosphériques.

«Première priorité,» le rapport d'étape sur la mise en oeuvre des recommandations de la Commission sur l'intégrité écologique, mentionne que Parcs Canada est à la recherche de fonds afin d'élaborer un programme de contrôle de la pollution atmosphérique en collaboration avec le Service météorologique du Canada (SMC). Le rapport mentionne également que Parcs Canada cherche à mettre au point un nouveau protocole d'entente avec les organismes scientifiques du gouvernement. Un protocole d'entente complet avec le SMC

procurerait une meilleure base pour assurer la surveillance des conditions météorologiques, de la qualité de l'air et pour la recherche sur les enjeux atmosphériques dans les parcs nationaux. En remplissant avec soin ce questionnaire, vous permettrez à Parcs Canada d'évaluer le niveau de coopération actuel avec le SMC, et de déterminer les sujets qui doivent être abordés dans le protocole d'entente, d'identifier les problèmes à résoudre de même que le financement requis.

Les instructions pour remplir le questionnaire se trouvent dans les fichiers d'instructions et d'exemple générique ci-joints. Veuillez le remplir et le retourner d'ici le 30 juin 2001 à David Welch, Direction générale de l'intégrité écologique.

Nous vous remercions à l'avance de l'attention que vous accorderez à cet exercice, et pour les renseignements que vous nous fournirez.

Bruce Amos

INSTRUCTIONS

1. Pour abréger la formulation, le mot "parc" sera utilisé en référence à un parc national existant ou à une aire marine nationale de conservation existante.

2. Si une autre personne dans votre parc ou unité de gestion est mieux placée pour assumer le rôle de personne-ressource pour les enjeux atmosphériques, veuillez transmettre cette demande à cette personne et prévenir David Welch du changement le plus tôt possible.

3. Les versions française et anglaise du questionnaire se trouvent dans les dossiers *Air-q-francais-questionnaire.wpd* et *Air-q-english-questionnaire.wpd.* Pour démontrer comment remplir le questionnaire, des réponses fictives sont incluses dans les dossiers *Air-q-français-exemple.wpd* et *Air-q-english-sample.wpd.*

4. Deux autres dossiers sont annexés afin de vous aider à revoir et mettre à jour vos informations. Il y a d'abord la compilation de tous les questionnaires retournés dans la langue originale, *Air-q-bilingual-results-1998.wpd.* L'inventaire de tous les postes météorologiques de Parcs Canada préparé en 1999 par l'Unité de gestion nationale des incendies est aussi inclus sous : *Stations-fire-feux-1999.xls.*

5. On demande des renseignements pour **chaque parc et non chaque unité de gestion**; veuillez donc reproduire le formulaire pour chaque parc de votre unité de gestion. Dans le cas de Banff, où deux unités de gestion se partagent le parc, veuillez travailler avec votre collègue afin d'en arriver à une réponse commune pour le parc.

6. Plusieurs questions peuvent avoir des réponses multiples, votre liste d'enjeux atmosphériques, par exemple. Dans un tel cas, copiez les titres aussi souvent que vous en avez besoin.

7. Utilisez la section COMMENTAIRES à la fin pour fournir d'autres renseignements sur l'une ou l'autre des questions ou pour traiter de sujets qui n'apparaissent pas dans le questionnaire.

8. Retournez les renseignements à David Welch par courriel en WordPerfect. Veuillez communiquer avec lui si vous avez besoin d'explications additionnelles.

Veuillez envoyer les renseignements suivants par courriel à:

David Welch, Conseiller en sciences physiques
Direction générale de l'intégrité écologique, Parcs Canada
25, rue Eddy, 4e étage
Hull (Québec) K1A 0M5
Téléphone : (819) 994-5532, Télécopieur : (819) 997-3380

Veuillez nous retourner le questionnaire rempli d'ici le 30 juin 2001.

Merci.

Questionnaire sur les enjeux atmosphériques - 2001 : formulaire-réponse proposé

PARTIE 1 - LA FICHE D'IDENTIFICATION

NOM DU PARC . . . . . : Parc national Atlantis

PERSONNE QUI REMPLIT LE QUESTIONNAIRE
Nom et fonction . . . . . : David Welch, Conseiller en sciences physiques
Section de Parcs Canada . . . . . : Direction générale de l'intégrité écologique
Téléphone . . . . . : (819) 994-5532

PARTIE 2 - LES PROGRAMMES

SURVEILLANCE
Pour faire de la surveillance, on doit observer des phénomènes de façon continue, répétitive, selon un horaire pré-établi, dans des endroits pré-établis et à l'aide d'une méthodologie qui permet la mise en commun des observations entre les stations, les réseaux et les programmes, et entre les anciens et les nouveaux protocoles.

Stations météorologiques
Prenez bien soin d'indiquer toute station météorologique, qu'elle soit située dans vos parcs ou à l'extérieur, dont Parcs Canada est responsable. Notez également les stations d'avalanche et les stations météo-incendie.

Nom ..... : Île du Golfe
Lieu (lat/long en décimal) .... : 47.50N, 62.50W (bâtiments des travaux)
Type et durée ..... : Automatisée, toute l'année
Type d'information disponible . : Température, précipitations, vitesse et direction des vents, humidité relative, rayonnement
Entrée en fonction ..... : 1947
Organisme ..... : Environnement Canada
Type de services offerts par Parcs Canada (PC) ..... : Entretien courant et transfert des données

Nom ..... : Autoroute des glaces
Lieu (lat/long en décimal) .... : 45.60N,62.75W (Station Zebra de surveillance des glaces)
Type et durée ..... : Manuelle, prévisions météo-incendie printemps/été
Type d'information disponible . : Température, précipitations, vitesse et direction des vents
Entrée en fonction ..... : 1974
Organisme ..... : Parcs Canada
Type de services offerts par PC : Achat d'équipement, entretien courant et transfert de données

Autres stations ou programmes de surveillance de la qualité de l'air
Inclure les programmes traitant de la qualité de l'air, même si les données ne sont pas recueillies annuellement (p. ex., un échantillonnage prélevé à quelques années d'intervalles).

Programme ou type de station . : Réseau canadien de surveillance des précipitations acides
Lieu ..... : Bâtiments des travaux
Type d'information disponible . : Dépôt humide de sulfate et de nitrate, pH de la pluie
Entrée en fonction ..... : 1978
Organisme(s) ..... : Environnement Canada, Ressources naturelles Canada et l'Université du Canada
Type de services offerts par PC : Protection du site, électricité, lignes de communication, coordination

Programme ou type de station . : Dispositif national d'alerte rapide pour les pluies acides
Lieu ..... : Basse vallée du chenal Laurentien
Type d'information disponible . : Croissance, structure et densité de la couronne, composition chimique du feuillage, état des arbres, type de ravageurs
Entrée en fonction ..... : 1984
Organisme ..... : Ressources naturelles Canada
Type de services offerts par PC : Aucun

RECHERCHE
Veuillez indiquer les enquêtes sur la qualité de l'air terminées depuis 1996 ou toujours en cours et qui n'exercent pas de surveillance.

Projet	:	Présence de mercure chez le huard et les poissons
Lieu	:	Lac Downpour
Objectif	:	Définir le mode de comportement des huards et de leurs oisillons et les mouvements de leur population en fonction des concentrations de mercure dans le sang et les plumes
Début et fin	:	Se poursuit depuis 1992
Organisme(s)	:	Environnement Canada, Université du Canada, Santé Canada
Type de services offerts par PC	:	Logistique et laboratoire de terrain

Projet	:	Effets des émissions de particules sur la santé publique
Lieu	:	Terrain de camping principal
Objectif	:	Évaluation des effets des particules atmosphériques provenant des feux de camp et de forêt sur la visibilité et la santé publique
Début et fin	:	1997-1999
Organisme	:	Ministère de l'Environnement de la province
Type de services offerts par PC	:	Entreposage des instruments, entretien hebdomadaire

INTERPRÉTATION ET COMMUNICATIONS EXTÉRIEURES

Dressez une liste des communications et des interactions publiques entreprises par le parc (p. ex., affiches, dépliants, brochures, expositions, vidéos, randonnées guidées, présentations, etc.). Veuillez mentionner l'organisme auteur. S'il n'y en a pas, veuillez l'indiquer.

1. Les panneaux d'indice UV d'Environnement Canada
2. Les fiches d'information de Santé Canada sur les effets du smog et des particules atmosphériques et les risques qu'ils présentent pour la santé
3. Le diaporama sur le déclin de la population des amphibiens et de l'utilisation globale des pesticides
4. L'appui des programmes d'études secondaires sur les changements climatiques

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PARTIE 3 - ENJEUX ATMOSPHÉRIQUES ET RESSOURCES CONNEXES

Pour compléter cette section d'une manière adéquate, veuillez vous référer à la section sur la qualité de l'air du Rapport de 1999 sur l'état des aires patrimoniales protégées et à votre section du Rapport 2000 sur le changement climatique et le réseau des parcs nationaux du Canada. Si vous n'avez pas reçu copie du premier rapport, vous pouvez le télécharger de la page Bibliothèque/Rapports du site web de Parcs Canada. L'an dernier, on a fait parvenir une copie du rapport sur le changement climatique à chaque directeur d'unité de gestion et à la personne-ressource en charge des enjeux atmosphériques. Si vous n'en avez pas reçu une copie, vous pouvez la télécharger de : http://www.msc-smc.ec.gc.ca/airg/research.htm, Groupe de recherche sur l'adaptation et les répercussions d'Environnement Canada.

ENJEUX ATMOSPHÉRIQUES TRAITÉS DANS LES DOCUMENTS ACTUELS DE GESTION DES PARCS

Dressez une liste des enjeux atmosphériques mentionnés dans les documents de gestion des parcs, notamment la déclaration sur l'intégrité écologique, le plan directeur du parc, le plan de conservation des écosystèmes, le Système de gestion de l'environnement, les plans de gestion du feu, les protocoles d'entente interorganisationnels, ou tout autre document officiel ayant trait à la gestion des parcs.

Problème ..... : Concentration élevée de mercure
Ressources affectées ..... : Le poisson d'eau douce et sa consommation (avis sanitaire)

Ressource menacée ..... : La sauvagine piscivore

Problème ..... : Les pluies acides
Ressources affectées ..... : Toutes les espèces lacustres
Ressources menacées ..... : L'érable rouge, l'asclépiade, le monarque

Problème ..... : Réchauffement planétaire
Ressources affectées ..... : La baisse du taux d'humidité du sol au printemps; le mouvement des cardinaux vers le nord
Ressources menacées ..... : Le pergélisol, les rivages des lagunes et des marais, l'habitat du pluvier siffleur

AUTRES ENJEUX ATMOSPHÉRIQUES

Précisez les autres enjeux atmosphériques qui, à votre avis, devraient être mentionnés.

Problème ..... : La brume sèche et le smog
Ressources affectées ..... : La santé des visiteurs s'adonnant à des activités aérobiques
Ressources menacées ..... : Le lac Downpour et les points d'observation panoramiques de Tickle Pass

Problème ..... : Le manque d'ensoleillement causé par la pollution provenant des villes ou des régions adjacentes
Ressources affectées ..... : L'observation des aurores boréales
Ressources menacées ..... : L'observation des constellations

IMPORTANTES SOURCES LOCALES DE POLLUTION

Énumérez les principales sources de pollution de l'air dans l'écosystème du parc et de la région environnante ainsi que dans le bassin atmosphérique. N'INDIQUEZ PAS les sources de pollution continentales ou globales, telles que «le transport urbain» ou «les émissions industrielles». INDIQUEZ les sources locales précises telles que les parcs de chemin de fer, les fonderies, les usines pétrochimiques ou les pesticides provenant des fermes environnantes. Veuillez répéter le titre au besoin.

Type de pollution ..... : Les émanations des hydrogènes sulfurées causées par la désulfurisation
Lieu de la source ..... : Le complexe pétrochimique situé à 50 km à l'est du parc
Fréquence ..... : Une ou deux fois par mois

Type de pollution ..... : La fumée, le dioxyde de carbone et le bruit
Lieu de la source ..... : Les chantiers de construction navale situés sur le site du parc
Fréquence ..... : Quotidiennement, à longueur d'année

RESSOURCES AFFECTÉES PAR LA QUALITÉ DE L'AIR

Indiquez jusqu'à cinq ressources précises du parc qui dépendent d'une bonne qualité de l'air ou d'un climat naturel, pour leur existence ou pour l'appréciation des visiteurs. Évitez les généralités telles que «l'intégrité de l'écosystème,» «la faune» ou «la productivité,» mais parlez des espèces particulières, des communautés, des panoramas, du relief, des édifices historiques ou des activités des visiteurs. Votre liste peut inclure les valeurs et les enjeux indiqués ci-dessus, mais vous avez également l'occasion d'indiquer par exemple des valeurs qui exigent une bonne qualité de l'air, tel qu'un panorama célèbre ou des pierres tombales en marbre que les pluies acides n'ont pas encore affectées.

Espèce affectée ..... : La salamandre à quatre doigts
Problèmes ..... : Les pesticides organochlorés persistants, la contamination de l'ozone troposphérique, le rayonnement ultraviolet B

Espèce affectée ..... : La tremblaie canadienne
Problèmes ..... : La hausse de la concentration d'azote causée par la dérive d'engrais riches en nitrates, les changements climatiques

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PARTIE 4 - COMMENTAIRES

Faites-nous de vos commentaires ou d'anecdotes, courts ou longs, à votre choix.
Vous pourriez :

- donner des exemples de pollution affectant présentement le parc;
- décrire de façon générale le contexte de la qualité de l'air dans la région;
- reproduire les sections de la déclaration sur l'intégrité écologique de votre parc qui traitent de la qualité de l'air;
- décrire comment la pollution de l'air ou les changements climatiques affectent déjà des valeurs spécifiques;
- décrire le travail accompli avec les partenaires régionaux visant à étudier ou améliorer la qualité de l'air; et/ou
- décrire les problèmes que vous avez eus avec l'opération de stations météorologiques;
- etc..

Le parc national Atlantis n'est pas à l'abri des retombées nord-américaines d'émissions polluantes et, par conséquent, est exposé à une quantité importante de polluants

atmosphériques qui affectent les lacs, les cours d'eau et la végétation - les plus nocifs étant les sulfates et les oxydes d'azote. En raison de sa composition géologique, les sols et les eaux des parcs présentent naturellement une forte acidité et possède un faible pouvoir tampon. Les écosystèmes aquatiques et terrestres sont donc particulièrement touchés par l'effet cumulatif des pluies acides. La contamination de l'ozone troposphérique dans les parcs nationaux donne parfois lieu à des phénomènes atmosphériques tels le smog et une visibilité réduite. Lorsque cela se produit, la santé des visiteurs des parcs qui s'adonnent à des activités aérobiques (par exemple, l'escalade en altitude) s'en trouve menacée. En outre, on estime que le réchauffement planétaire pourrait provoquer le dégel des îlots de pergélisol résiduels des tourbières hautes, même si jusqu'à ce jour aucun changement n'a été observé. Des quantités importantes de fumée causée par les feux de camp durant la haute saison avaient autrefois des répercussions sur la qualité de l'air et la visibilité sur les routes adjacentes. Aujourd'hui, ce problème n'existe plus en raison de la tarification du bois dans les terrains de camping.

Les parcs nationaux sont des points d'intérêt pour la recherche sur les retombées des polluants atmosphériques. Des recherches connexes menées par plusieurs institutions, universités et organismes gouvernementaux jouent un rôle déterminant dans l'acquisition des connaissances nécessaires aux interventions environnementales destinées à améliorer la qualité de l'air et à prévenir les changements climatiques. Même si les parcs nationaux profitent de l'appui à long terme de programmes de ce genre, ils ont, à plusieurs occasions, éprouvé des difficultés à accéder aux données météorologiques recueillies par leurs propres stations et transmises à Environnement Canada.

APPENDIX 3

RETURNS

EDITORIAL POLICY

This appendix is based on the questionnaire inputs from each park in the language submitted. However, I have made minor spelling and phrasing changes throughout for clarification and to achieve a consistent style and format. I have also corrected or added relevant new information as it become known to me up to the time of submission for publication. This relates mainly to weather station information.

ANNEXE 3

RÉSULTATS

PRÉSENTATION

Cette annexe est basée sur les résultats des questionnaires reçus de chacun des parcs, dans la langue de la communication. J'ai cependant apporté des changements mineurs à l'orthographe et à la formulation, dans l'intérêt de la clarté et de la cohérence du style et du format. J'ai également corrigé ou ajouté de nouvelles informations pertinentes, telles qu'elles ont pu me parvenir jusqu'au moment de la publication. Ces informations ont surtout trait aux stations météorologiques.

ABBREVIATIONS/ABRÉVIATIONS

???	Uncertain or ambiguous information Information incertaine ou ambiguë
??-??	Month and date unknown Mois et date inconnus
APC	Agence Parcs Canada
AVHRR	Advanced Very High Resolution Radiometer (satellite optical and microwave imager)
BOREAS	BOReal Ecosystem-Atmosphere Study
CCRS	Canada Centre for Remote Sensing
CFS	Canadian Forestry Service, Natural Resources Canada
CID	Carbone Inorganique Dissous
COD	Carbone Organique Dissous
CS	Campbell Scientific
CWS	Canadian Wildlife Service, Environment Canada
DIAND	Department of Indian and Northern Affairs Canada
DDT	Dichloro-Diphenyl-Trichloroethane
DOC	Dissolved Organic Carbon
DV	Direction du vent
EI	Ecological Integrity
EMAN	Ecological Monitoring and Assessment Network
F	Facsimile
HR	Humidité Relative
IE	Integrité Écologique
LRTAP	Long Range Transport of Airborne (or Atmospheric) Pollutants

MSC	Meteorological Service of Canada, Environment Canada
NASA	National Aeronautical and Space Administration, United States
NRC	Natural Resources Canada
NWT	Northwest Territories
P	Precipitation Précipitation
PCA	Parks Canada Agency
PCB	Polychlorinated biphenyl
PFIS	Park Fire Information System
PM	Particulate Matter
RÉSÉ	Réseau d'Évaluation et de Surveillance Écologique
RH	Relative humidity
SIFP	Système d'Information sur les Feux à Parcs Canada
SMC	Service Météorologique du Canada
T	Telephone number or temperature, depending upon obvious context Numéro de téléphone ou température, en accord au contexte évident
TADPA	Transport À grande Distance des Polluants Atmosphériques
VV	Vitesse du vent
WD	Wind direction
WS	Wind speed
x	Telephone extension number N° du poste téléphonique

In addition, common scientific notations are used without explanation. Also, parks names are abbreviated without explanation within their own section, thus KNP means Kejimkujik National Park, Kouchibouguac National Park or Kootenay National Park depending on context, and NNPR means Nahanni National Park Reserve.

Par ailleurs, j'ai utilisé les notations scientifiques courantes sans autre explication. Les noms des parcs paraissent également en abrégé sans explication dans leur propre section : ainsi, KNP désigne le Kejimkujik National Park (parc national Kejimkujik), le Kouchibouguac National Park (parc national Kouchibouguac) ou le Kootenay National Park (parc national Kootenay), selon le contexte, alors que NNPR désigne la Nahanni National Park Reserve (réserve de parc national Nahanni).

WEATHER STATION INFORMATION

I added weather station names, identifiers and sometimes whole entries based on a GIS overlay of park boundary files with MSC weather station catalogue data.

INFORMATIONS SUR LES STATIONS MÉTÉOROLOGIQUES

J'ai ajouté les noms des stations météorologiques, les identificateurs, et parfois les entrées au complet d'après un transparent superposable SIG aux limites

These data are also available on-line at www.msc-smc.ec.gc.ca/climate/station_catalogue/index_e.cfm. These identities have been added according to my best guess at matching station names and locations to those provided by park correspondents, since many disagree in name and by up to a minute of latitude or longitude. In one case the disagreement is over 20 minutes of arc. This is probably due to discrepancies in old and new map datums, and of precision in reading locations of topographic sheets versus new GPS measures. I have retained the names given by parks as separate entries. In some parks, MSC indicates stations in parks that were not identified at all by the park air issues contact. These are included as well.

des parcs, avec les données du catalogue des stations météorologiques du SMC. Ces données sont également disponibles en ligne, à www.msc-smc.ec.gc.ca/climate/station_catalogue/index_f.cfm. Ces éléments ont été ajoutés d'après ma meilleure évaluation des noms et des endroits de stations correspondants à ceux fournis par les personnes-ressources des parcs, puisque pour beaucoup, les noms ne sont pas les mêmes, et les latitudes ou les longitudes peuvent s'écarter de près de un degré. Dans un cas, le désaccord est de plus de 20 minutes d'arc. Ceci est probablement dû à des divergences des points de référence des anciennes et des nouvelles cartes, et à la précision de l'indication des emplacements des cartes topographiques par rapport aux nouvelles mesures GPS. J'ai conservé les noms donnés par les parcs en tant qu'entrées distinctes. Dans certains parcs, le SMC fait état de stations dans les parcs qui n'ont pas été mentionnées du tout par la personne-ressources pour les enjeux atmosphériques du parc. Celles-ci sont incluses également.

I have added the five letter identifier used by PFIS. In some cases PFIS identifies stations not reported in the questionnaire returns, so I have also added these identities. Again, this is a best-guess match since latitude and longitude values often differ.

J'ai ajouté l'identificateur à cinq lettres utilisé par le SIFP. Dans certains cas, le SIFP identifie des stations qui n'apparaissent pas dans les résultats des questionnaires, et j'ai donc ajouté également celles-ci. Encore une fois, il s'agit de la meilleure estimation, puisque souvent, les latitudes et longitudes diffèrent.

Please note that the questionnaire returns identified 125 weather and climate stations. The MSC and PFIS records reveal 41 more, for a total of 166.

Veuillez noter que d'après les résultats des questionnaires, il y avait 125 stations météorologiques et climatologiques. D'après le SMC et le SIFP, il y en a 41 autres, pour un total de 166.

Where coordinates differ from those given to me by a park contact, I show the more precise ones on the assumption that these have been generated more scrupulously or more recently using a global positioning system. In the event of a tie, I retain the PCA version. However, all coordinates should be treated as approximate, since I also have no knowledge of which geodetic datums were used. I kept the start dates to the oldest known to me, since some stations may have data available before being catalogued by MSC. If the year matches, I used the most precise date known to me.

Lorsque les coordonnées diffèrent de celles qui m'ont été fournies par la personne-ressource du parc, je donne les coordonnées plus précises, d'après l'hypothèse que celles-ci ont été établies plus attentivement ou plus récemment à l'aide d'un système mondial de localisation. En cas d'indications équivalentes, j'ai conservé la version de l'APC. Il faut cependant considérer toutes les coordonnées comme approximatives, bien que je ne sais pas quels points de référence géodésiques ont été utilisés. Comme dates de début, j'ai conservé les plus anciennes dont j'ai eu connaissance, puisque certaines stations peuvent disposer de données avant d'avoir été cataloguées par le SMC. Lorsqu'il s'agit de la même année, j'ai utilisé la date la plus précise dont j'ai eu connaissance.

In sum, therefore, the lists of weather stations should be regarded as a close approximation of the weather stations that are actually out there, either in parks or nearby and operated in whole or part by PCA staff. This could be as low as 125 and as high as 166. Only a station-by-station check done in the joint presence of the park air issues contact and the park fire information contact, with access to the MSC data catalogues, could resolve all the uncertainties.

En résumé donc, les listes des stations météorologiques doivent être considérées comme une bonne approximation de ce qui existe réellement, que ce soit dans les parcs ou à proximité, et qu'elles soient exploitées en tout ou en partie par le personnel de l'APC. Le chiffre exact pourrait se situer entre 125 et 166. Seule une vérification station par station faite conjointement par la personne-ressource pour les enjeux atmosphériques dans le parc et la personne-ressource pour le système d'information sur les feux, avec accès aux catalogues de données du SMC, pourrait permettre de résoudre toutes les incertitudes.

Geographic coordinates are given as:

- decimal latitude degrees (default positive for the northern hemisphere) to four decimal places;

Les **coordonnées géographiques** sont indiquées comme suit :

- les degrés de latitude en décimales (positifs par défaut dans l'hémisphère nord) jusqu'à la quatrième décimale;

- signed decimal longitude (negative for the western hemisphere) to four decimal places;
- degrees, minutes and seconds latitude;
- degrees minutes and seconds longitude; and
- elevation in metres above sea level to one decimal place.

- les degrés de longitude en décimales (négatifs dans l'hémisphère ouest) jusqu'à la quatrième décimale;
- la latitude en degrés, minutes et secondes;
- la longitude en degrés, minutes et secondes;
- l'élévation en mètres au-dessus du niveau de la mer jusqu'à la première décimale.

AULAVIK

Air issues contact. Ian McDonald, Western Arctic Field Unit
Person(s) completing the questionnaire. Ian McDonald

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Thomsen River, #2503886
PCA name ..... : Green Cabin
Location ..... : 73.2303, -119.5367; 73°13'49"N, 119°32'12"W; 37.0 m asl
Type and duration : Automatic, year-round, satellite transmission
Properties recorded: T, P, RH, WS WD, incoming shortwave radiation (RF1), dew point, snow fall and depth, barometric and vapour pressure, UV-B radiometer.
Start date ..... : 1996-06-27
Ownership ..... : PCA
PCA support .... : Purchase and installation, routine service, data transfer

MSC name ..... : Aulavik National Park, #2500440
PCA name ..... : Polar Bear Cabin
Location ..... : 74.1417, -119.9903; 74°08'30"N, 119°59'25"W; 32.0 m asl
Type and duration : Automatic, year-round, satellite transmission
Properties recorded: T, P, RH, WS, WD, incoming shortwave radiation (RF1), dew point, snow fall and depth, barometric and vapour pressure.
Start date ..... : 1996-06-26
Ownership ..... : PCA
PCA support .... : Purchase and installation, routine service, data transfer

Other air monitoring stations or programmes
None

RESEARCH
None

INTERPRETATION AND OUTREACH
1. Annual research and monitoring report, 1999 and 2000. PCA Western Arctic Field Unit.
2. Environmental Stewardship Programme. PCA Western Arctic Field Unit.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : Habitat (e.g. vegetation, permafrost, etc.) and wildlife

Value(s) at risk . . : Vegetation, wildlife and landforms

Issue . . . . . : LRTAP
Value(s) impacted : ???
Value(s) at risk . . : Water quality, wildlife and habitat, human health

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES
Value . . . . . : Permafrost
Issue(s) . . . . . : Climate warming

Value . . . . . : Tundra habitat
Issue(s) . . . . . : Climate warming, vegetation change

Value . . . . . : Water quality
Issue(s) . . . . . : LRTAP

COMMENTS
None

AUYUITTUQ

Air issues contact. Vicki Sahanatien, Nunavut Field Unit
Person(s) completing the questionnaire. Paula Hughson, Nunavut Field Unit; Marco Dussault for climate stations.

PROGRAMMES

MONITORING

Weather stations
MSC name . . . . . : Pangnirtung, #2403049 (formerly #2403053)
PCA name . . . . . : Pangnirtung
Location . . . . . : 66.1500, -65.7167; 66°09'00"N, 65°43'00"W; 22.6 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, net radiation, soil temperature at approx. 10 cm
Start date . . . . . : 1983-04-15
Ownership . . . . . : PCA

PCA support .... : Purchase of equipment; MSC operates

PCA name ..... : Summit Lake
Location ..... : 66.6135, -65.2243; 66°36'49"N, 65°13'28"W; ??? m asl
Type and duration : Automatic, year-round
Properties recorded : T, RH, WS, WD, net radiation, soil temperature at approx. 10 cm
Start date ..... : 1998
Ownership ..... : PCA
PCA support .... : Purchase and installation; download data; maintenance done by arrangement with Campbell Scientific.

Summit Lake has had problems in the past of proper download of data.

Other air monitoring stations or programmes
Name ..... : Landscape monitoring using AVHRR satellite images
Location ..... : Park area
Properties recorded : Snow cover and vegetation productivity
Start date ..... : 1984 - first available image
Agency(ies) .... : PCA
PCA support .... : Take measurements and summarize data

RESEARCH
None

INTERPRETATION AND OUTREACH
1. Visitor information package. Summaries of historic monthly weather conditions are provided for public safety reasons.
2. Community and visitor interpretation of monitoring programmes.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : ???
Value(s) at risk .. : Change in vegetation productivity - change in availability and quality of wildlife habitat.

OTHER AIR ISSUES

Issue ..... : LRTAP
Value(s) impacted : Health of plants and animals
Value(s) at risk .. : Effects on vegetation productivity, effects on water quality, effects on fish species productivity and survivability and quality as a food source.

Issue . . . . . : Increased UV-B radiation
Value(s) impacted : Greater risk of sunburns for people
Value(s) at risk . . : Effects on vegetation, effects on park staff and visitors

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
Type . . . . . : Diesel electricity generating stations
Location of source : Pangnirtung and Qikiqtarjuak
Frequency . . . . . : Non-stop, year-round

Type . . . . . : Open air burning of all household garbage
Location of source : Pangnirtung and Qikiqtarjuak
Frequency . . . . . : Non-stop, year-round

AIR ISSUE RELATED VALUES
None

COMMENTS
The weather station has not been visited in a couple of years and we do not know the state it is in, etc..

BANFF
Air issues contacts. Terry Damm, Kootenay/Yoho/Lake Louise Field Unit
Person(s) completing the questionnaire. Dave Hunter, Banff Field Unit; Terry Damm

PROGRAMMES
MONITORING
Weather stations
MSC name . . . . . : Banff CS, #3050519
PCA name . . . . . : Banff Townsite, #BAWZG
Location . . . . . : 51.1900, -115.5500; 51°11'24"N, 115°33'00"W; 1396.9 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, pressure, visibility
Start date . . . . . : 1997-10-21
Ownership . . . . . : MSC
PCA support . . . . : None

MSC name . . . . . : (AE) Bow Summit, #3050PFP
Location . . . . . : 51.7000, -116.4670; 51°42'00"N, 116°28'00"W; 2080.0 m asl
Type and duration : ???
Properties recorded : T, P

Start date ..... : 1989-09-28
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Bow Summit (PC), #305A002
PCA name ..... : Bow Summit, Highway 93 N
Location ..... : 51.7900, -116.5600; 51°47'24"N, 116°33'36"W; 2011.7 m asl
Type and duration : Automatic, year-round
Properties recorded: T, RH, WS, WD, snow depth
Start date ..... : 1991
Ownership ..... : PCA
PCA support .... : Equipment, maintenance and monitoring

MSC name ..... : Castle Mountain Village, #3051424
Location ..... : 51.2667, -115.9170; 51°16'00"N, 115°55'00"W; 1524.0 m asl
Type and duration : ???
Properties recorded: T, P
Start date ..... : 1983-05-01
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Cuthead Lake, #3051R51
Location ..... : 51.4500, -115.7670; 51°27'00"N, 115°46'00"W; 2179.0 m asl
Type and duration : ???
Properties recorded: P
Start date ..... : 1981-09-01
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : False Nicholas, #3052603
PCA name ..... : False St. Nicholas Peak, Wapta Icefields
Location ..... : 51.6255, -116.4669; 51°37'32"N, 116°28'01"W; 2926.1 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1991
Ownership ..... : PCA
PCA support .... : Equipment, maintenance and monitoring

MSC name ..... : Lake Louise, #3053760
PCA name ..... : Lake Louise Warden Office, #BALKL
Location ..... : 51.4300, -116.1900; 51°25'48"N, 116°11'24"W; 1554.5 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, snow depth sensor

Start date ..... : 1915-01-01
Ownership ..... : PCA
PCA support .... : Equipment, maintenance and monitoring

MSC name ..... : Lookout, #305A003
PCA name ..... : Sunshine Ski Area, Lookout Mountain
Location ..... : 51.0743, -115.7582; 51°04'27"N, 115°45'30"W, 2621.0 m asl
Type and duration : ???, year-round
Properties recorded: T, RH, WS, WD
Start date ..... : 1984
Ownership ..... : PCA
PCA support .... : Equipment, maintenance and monitoring

MSC name ..... : Goat's Eye, #3052838
PCA name ..... : Sunshine Ski Area, Village area
Location ..... : 51.0781, -115.7824; 51°04'41"N, 115°46'57"W, 2200.0 m asl
Type and duration : ???, year-round
Properties recorded: T, P, RH, snow depth sensor, snow pillow
Start date ..... : 1984
Ownership ..... : PCA
PCA support .... : Equipment, maintenance and monitoring

MSC name ..... : Sask River Crossing 2, #3055754
PCA name ..... : Saskatchewan Crossing, #BASAX
Location ..... : 51.9678, -116.7117; 51°58'04"N, 116°42'42"W; 1402.1 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, snow depth
Start date ..... : 1976-11-01
Ownership ..... : PCA
PCA support .... : Equipment, maintenance and monitoring

MSC name ..... : Scotch Camp, #3055768
Location ..... : 51.6667, -115.8000; 51°40'00"N, 115°48'00"W; 1737.4 m asl
Type and duration : ???
Properties recorded: P
Start date ..... : 1981-08-01
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Skoki, #3055976
Location ..... : 51.5333, -116.0500; 51°32'00"N, 116°03'00"W; 2040.0 m asl
Type and duration : ???
Properties recorded: P

Start date ..... : 1981-09-01
Ownership ..... : MSC
PCA support .... : None

PCA name ..... : Spray???, #SPRAY
No further information in the PFIS database

PCA name ..... : Sundee, Albert (sic), #BAWAV
Location ..... : 51.4600, -114.4100; 51°27'36"N, 114°24'36"W; 1115.0 m asl
Type and duration : ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Temple, #3056LPA
Location ..... : 51.4333, -116.1500; 51°26'00"N, 116°09'00"W; 1891.0 m asl
Type and duration : ???
Properties recorded: T, P
Start date ..... : 1989-09-26
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Upr Parker Ridge, #3056657
Location ..... : 52.1833, -117.0830; 52°11'00"N, 117°05'00"W; 2316.5 m asl
Type and duration : ???
Properties recorded: T, P
Start date ..... : 1998-10-31
Ownership ..... : MSC
PCA support .... : None

PCA name ..... : Ya Ha Tinda Ranch, #BAYAH
Location ..... : 51.7464, -115.5665; 51°44'47"N, 115°33'59"W; 1700.0 m asl
Type and duration : Automatic, ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : All

Other air monitoring stations or programmes
Name ..... : Mobile Survey
Location ..... : ???
Properties recorded: Average and maximum daily pollutant concentrations

Start date ..... : 1994-03-02
Agency(ies) .... : Alberta Environmental Protection
PCA support .... : None

RESEARCH

Project ..... : Park Airshed Monitoring System (PAMS), Bow Summit
Purpose ..... : Monitor NO_2, O_3, SO_2
Start and end dates : 1998-2001
Agency(ies) .... : Clean Air Strategic Alliance of Alberta
PCA support .... : Federal land

Project ..... : Persistent organic pollutants in osprey in the Rocky Mountains
Purpose ..... : To determine organochlorine concentrations in osprey eggs and young at selected nesting sites in subalpine areas of the Rocky Mountains, and to evaluate whether such exposure may be harmful to the birds and to relate organochlorine concentrations in eggs and nestling blood to concentrations in fish.
Start and end dates : ???, possibly 1998 or 1999, to 2001, renewable year-to-year
Agency(ies) .... : Environment Canada
PCA support .... : Field logistics, egg collection in Banff, Jasper and Waterton Lakes

INTERPRETATION AND OUTREACH

1. Environment Canada posters on global warming, ground level smog, ozone depletion
2. Parks Canada Fire/Vegetation Fact Sheet on smoke generated by forest fires/prescribed burns
3. Upper Hot Springs - H_2S venting

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Banff Park Management Plan 3.6.1 Strategic Goal: to maintain the highest possible standards of air quality and to ensure that human sources of pollution do not impair visibility, the ability of the ecosystem to support a full range of naturally occurring species, or human safety.
Value(s) impacted : ???
Value(s) at risk .. : Ecological integrity, aesthetics, public health

Issue ..... : Global warming - reduce greenhouse gas emissions - Department of Canadian Heritage Sustainable Development Strategy.
Value(s) impacted : ???
Value(s) at risk .. : ???

OTHER AIR ISSUES

Issue . . . . . : Stratospheric ozone depletion
Value(s) impacted : ???
Value(s) at risk . . : ???

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type . . . . . : Smoke from slash burning
Location of source : British Columbia
Frequency . . . . . : Sometimes during summer months

Type . . . . . : Motor vehicle exhaust
Location of source : Banff town site
Frequency . . . . . : Winter months during inversions

Type . . . . . : Air quality issues related to a change from natural gas fired plant to coal fired plant-Bow Valley.
Location of source : Canada LaFarge Cement Plant, Exshaw, Alberta
Frequency . . . . . : Ongoing with east winds

Type . . . . . : Smog
Location of source : Calgary, Alberta
Frequency . . . . . : Unknown

OTHER AIR ISSUE RELATED VALUES

None

COMMENTS

None

BRUCE PENINSULA

Air issues contact. Andrew Promaine, Southwest Ontario Field Unit
Person(s) completing the questionnaire. Andrew Promaine

PROGRAMMES

MONITORING

MSC name . . . . . : Cyprus Lake CS, #6121940
PCA name . . . . . : Cyprus, #BPCYP
Location . . . . . : 45.2333, -81.5333; 45°14' 00"N, 81°32'00"W, 190.0 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD

Start date ..... : Early 1970's; 1988 for continuous digital data
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, data transfer/communication lines, periodic service, power. MSC provides troubleshooting technical support on an "as required" basis.

Data collected is used to calculate forest fire weather indices. Data is also used in cooperation with the province for monitoring winter severity and the impacts on the white-tailed deer population.

RESEARCH

None

INTERPRETATION AND OUTREACH

1. Articles in local newspaper dealing with air quality issues (UV-A, UV-B, acid precipitation, etc.) as prepared by one of the park's interpretive staff.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climatic instability (identified in draft Ecosystem Conservation Plan)
Value(s) impacted : ???
Value(s) at risk .. : High degree of unknown in terms of vegetation change, disturbance regimes, species compositions, development pressures, etc..

OTHER AIR ISSUES

Issue ..... : Air quality change (primarily smog)
Value(s) impacted : Smog warnings (May, 2001)...impacts to humans
Value(s) at risk .. : Smog alerts have increased dramatically and becoming widespread. Uncertain of the impacts to the ecosystem.

Issue ..... : UV radiation
Value(s) at risk .. : Amphibian populations. There are no rare or threatened amphibian species exist in the park other than the 4-toed salamander, which is only recognized as rare in the park, nowhere else.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Smoke, CO_2
Location of source : Homes
Frequency ..... : Daily, primarily December through April

Type ..... : Smoke, CO_2 and noise
Location of source : Campground
Frequency ..... : Daily, primarily June to September

Type ..... : Smoke, CO_2 and noise
Location of source : Visitor vehicles, automobiles and boats
Frequency ..... : Daily, primarily June to September

OTHER AIR ISSUE RELATED VALUES

Value ..... : Panoramic viewpoints (lake)
Issue(s) ..... : Haze/smog occurs 6+ times/year, increasing every year. This was never really deemed an issue as we were too far from Toronto. This is no longer the case. Environment Canada has issued smog alerts for an area including the park as early as May 3, 2001. This is unprecedented.

COMMENTS

This air issue has never been deemed a priority. This is in large part due to a lack of knowledge. However, air quality in southern Ontario has become of concern due mostly to human health concerns. Unfortunately, research related to such issues, involving academic institutions or other government (federal/provincial) departments, is non-existent. The park is currently not involved in any "high level" air quality monitoring. It is, however, felt that such monitoring would be beneficial to the site and that if approached by outside agencies or groups, we would attempt to cooperatively explore development of a long term monitoring programme, aimed at specific issues such as air quality, climate change, UV radiation, smog, etc..

Winter issues are primarily wood smoke burning. Although this does occur, there is a relatively low population at this time, and the degree of impact is felt to be minimal.

Weather data is a bit of a tale. There is data from Tobermoray that was manually collected from 1914 to 1983. We have the digital results of this, but it is for precipitation and temperature only. In 1983, the station moved to Cyprus Lake. This is where it gets poor. The only thing we have is paper copies of the fire weather data, collected manually. That continued until 1988, the year Bruce Peninsula National Park was formed. From 1988 until 1996, it was automated, but very poorly and unreliably. Paper copies of fire weather exists. From 1996 to 1999, the fire weather automation worked well and we have that data. In 1999, we began collecting the data year-round. The worst period is 1983 to 1988, for which there is basically nothing.

Cove Island, in Fathom Five National Marine Park, is more for marine conditions and does not collect much of the winter parameters, but would collect sky condition and visibility. Cyprus is the opposite; it collects winter parameters, but not sky condition and visibility. Overall, I'd say we collected 75% of the possible parameters at each station. We hope to be meeting with the MSC guy soon, and ensure that we are getting the information that we want that is available.

CAPE BRETON HIGHLANDS and Fortress of Louisbourg National Historic Site

Air issues contact. James Bridgland, Cape Breton Field Unit
Person(s) completing the questionnaire. James Bridgland, with update from Neil Munro

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Cheticamp, #8200825
PCA name ..... : Cheticamp
Location ..... : 46.6447, -60.9470; 46°38'41"N, 60°56'49"W; 11.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, snow depth
Start date ..... : 1956-02-01, with minor relocation in 1998
Ownership ..... : MSC
PCA support .... : Routine servicing

MSC name ..... : Cheticamp CS, #8200827
PCA name ..... : Cheticamp
Location ..... : 46.6500, -60.9500; 46°39'00"N, 60°57'00"W; 44.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, snow depth???
Start date ..... : 1998-05-07
Ownership ..... : MSC
PCA support .... : Routine service
This may be a duplicate or replacement for the other Cheticamp station

MSC name ..... : Grand Etang, #8201969
PCA name ..... : Grand Étang, #CBCHE
Location ..... : 46.5500, -61.0333; 46°33'00"N, 61°02'00"W; 12.8 m asl
Type and duration : Automatic, year-round
Properties recorded: T, RH, WS, WD
Start date ..... : 1991-06-04
Ownership ..... : MSC, PCA
PCA support .... : Routine servicing

MSC name ..... : Ingonish Beach CS, #8202502
PCA name ..... : Ingonish Beach, #CBING
Location ..... : 46.6633, -60.4058; 46°39'48"N, 60°24'21"W; 8.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, snow depth, radiation
Start date ..... : ca. 1940 as manual station; automated in 1998

Ownership ..... : MSC
PCA support .... : Routine servicing

MSC name ..... : North Mountain CS, #8204161
PCA name ..... : North Mountain, #CBNOR
Location ..... : 46.8178, -60.6720; 46°49'04"N, 60°40'19"W; 439.4 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, snow depth
Start date ..... : 1997-10-06 for MSC, possibly 1995
Ownership ..... : MSC, PCA
PCA support .... : Routine servicing

PFIS also identifies a namesake at a nearby location with only the following information
PCA Name ..... : North Mountain (2), #NM-99
Location ..... : 46.8200, -60.6660; 46°49'12"N, 60°39'58"W

Fortress of Louisbourg National Historic Site
PCA name ..... : Fortress of Louisbourg National Historic Site, #FOLHS
Location ..... : 45.9078, -60.0097; 45°54'28"N, 60°00'35"W; 91.4 m asl
Type and duration : Manual, year-round, twice daily (three times daily during fire season)
Properties recorded: T, P, RH, WS, WD, snow depth
Start date ..... : Mid to late 1960s?
Ownership ..... : MSC, PCA
PCA support .... : Manual observation and recording

Other air monitoring stations or programmes
Name ..... : Acid Rain National Early Warning System
Location ..... : South Mountain
Properties recorded: ???
Start date ..... : Early 1990s to 2002 (terminated)
Agency(ies) .... : CFS
PCA support .... : None

Name ..... : LRTAP
Location ..... : Approximately 18 lakes on Cape Breton Plateau inside park
Properties recorded: Numerous inorganic parameters including pH, conductivity and about a dozen elements and ions.
Start date ..... : Early to mid 1980s
Agency(ies) .... : Environment Canada
PCA support .... : Sample collection

Name ..... : Ice watch
Location ..... : Freshwater Lake, Ingonish Beach

Properties recorded: Dates of ice-on, ice-off each winter
Start date ..... : 1977
Agency(ies) .... : PCA, Environment Canada (EMAN)
PCA support .... : Data collection

RESEARCH
Project ..... : Passive sampling of automotive pollutants
Purpose ..... : To determine cause of decline and disappearance of native lichen species at Lone Shieling, Grande Anse. In 2001 samplers were placed for ozone.
Start and end dates : 2001-2002
Agency(ies) .... : CFS, PCA
PCA support .... : Project definition, sample setup and collection

INTERPRETATION AND OUTREACH
1. Interpretive signage at Ingonish Automated Weather Station describes instruments which can be seen, what they measure and why Parks maintains weather stations. Authored by park staff.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Park Management Plan (1994) lists among ecosystem stressors "air pollution from distant and local sources including dump burning and the coal-generated power plant at Point Aconi."
Value(s) impacted : ???
Value(s) at risk .. : ???

OTHER AIR ISSUES

None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

From: Eaton, Hildebrand and d'Entremont, 1986, Environmental Quality in the Atlantic Region, Environment Canada, Environmental Protection Service, Dartmouth. Since 1986 Sydney Steel and mines have ceased operation so the numbers from there are probably no longer valid.

Type ..... : Pulp mills - PM, SO_2, NO_2
Location of source : New Glasgow, Port Hawkesbury
Frequency ..... : Uncertain, possibly throughout the year

Type ..... : Steel mill and coal mine - PM, SO_2, NO_2
Location of source : Sydney

Frequency ..... : Uncertain, possibly year-round, but mine and refinery have now closed

AIR ISSUE RELATED VALUES
None

COMMENTS

The park may set up the following contingent upon funding:
Project ..... : Air Quality Monitoring - Lone Sheiling
Purpose ..... : Investigate impact of automotive emissions (SO_2, NOx, Ozone) from Cabot Trail on epiphytic lichens of old growth Acadian hardwood forest.
Start and end dates : Start 2002. End yet to be determined. Lichen monitoring may be incorporated into long term EI monitoring programme.
Agency(ies) .... : PCA, CFS, University College of Cape Breton
PCA support .... : Funding passive samplers, sample collection

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ELK ISLAND

Air issues contact. Ross Chapman, Northern Prairies Field Unit
Person(s) completing the questionnaire. Ross Chapman

PROGRAMMES

MONITORING

Weather stations
MSC name ..... : Elk Island National Park, #3012275
PCA name ..... : Elk Island, #EIWFE
Location ..... : 53.6833, -112.8670; 53°41'00"N, 112°52'00"W; 716.2 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, snow depth
Start date ..... : 1981-12-01
Ownership ..... : MSC, PCA
PCA support .... : Provision of site

Monitoring is conducted by Environment Canada staff on a once and sometimes twice monthly basis. EINP has collected and recorded weather data since the early 1960s. In 1989, an automatic weather station was installed at EINP in cooperation with MSC. Weather database files from 1989 to 1998 at EINP focus only on fire weather monitoring. Fire weather monitoring data is collected from Spring to Fall. Database management of available weather data has never been implemented at EINP. Since 1993, climate data analysis has been conducted on an annual basis utilizing MSC data collected at Elk Island.

Other air monitoring stations or programmes

Name ..... : Mountain/Prairie Transect Air Monitoring Station
Location ..... : 53.6833, -112.8670; 53°41'00"N, 112°52'00"W
Properties recorded : PM 2.5, chemical composition of PM, O_3
Start date ..... : 1998
Agency(ies) .... : Environment Canada
PCA support .... : Occasional maintenance of filters when Environment Canada staff not available

Name ..... : PM and smog monitoring
Location ..... : Warden compound, at the weather station
Properties recorded : PM 2.5, O_3, PM 2.5 chemical species
Start date ..... : 2001
Agency(ies) .... : Environment Canada; Fort Air Partnership
PCA support .... : Site, phone line, electricity

RESEARCH

Project ..... : Bryophyte M.Sc. study (proposed, awaiting funding)
Purpose ..... : To inventory bryophytes in Elk Island ecosystem, study relationships, distribution and effects from air quality
Start and end dates : 2002
Agency(ies) .... : University of Alberta
PCA support .... : ???

INTERPRETATION AND OUTREACH

1. Display on air quality in Information Centre
2. Display by Fort Air Partnership on air quality in Elk Island region (display in local malls)

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : PM 2.5, O_3
Value(s) impacted : Visibility, acid deposition, increased nitrogen deposition
Value(s) at risk .. : Impact on non-vascular plants: potential decrease in distribution of lichens and mosses, effect on water quality, effect on human health (PM 2.5 is a potential health risk), effect on amphibian distribution (i.e. disappearance of Canadian toad from Elk Island ecosystem).

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Elk Island is downwind from a city of almost one million people, Edmonton. As well, it is also downwind from two petrochemical refineries and several other major petrochemical plants (i.e. Celanese, Dow, Shell and Goodyear).

Type ..... : Petrochemical complex - odour, H_2S, NH_3, SO_2, NO_2, CO, noise from plant generators, chemical plumes in winter visible from the park.
Location of source : East Edmonton, 20 km to 50 km from park, some directly upwind
Frequency ..... : Daily, year-round

Type ..... : Urban smog, haze
Location of source : Edmonton
Frequency ..... : Year-round???

AIR ISSUE RELATED VALUES
None identified

COMMENTS

Our air quality monitoring station is operated by Environment Canada and is part of a larger network. Most of the problems concern downloading data. Regional partnerships include Environment Canada, the Fort Air Partnership plus several chemical companies.

Current examples of air pollution affecting the park are PM 2.5, O_3, mostly from automobiles, home heating and chemical plants in the Edmonton area, and PM composition (NH_3, SO_2, NO, CO). The park air shed is classified as urban by air quality experts. The Elk Island/Beaverhill ecosystem is downwind from a major petrochemical complex and from a city of 900,000. A major expansion of the petrochemical section is underway, which could further impact the park air shed. The proximity of the park to major petrochemical industries within the Fort Saskatchewan and Edmonton area increases the probability of atmosphere contamination that may be impacting ecosystem integrity. This could exacerbate successional and/or retrogressional processes in the ecosystem. This could have significant impact on a small park that has limited buffering capacity.

It is not fully known how air quality is impacting park values. PM 2.5 is a significant health risk in humans as these particles, generated by automobiles, home heating, petrochemical and other sources, become imbedded in lung tissue. PM 2.5 may also have an impact on smaller mammals. Increased deposition of nitrogen from fertilizer plants in the park vicinity may lead to vegetation changes, although more study is needed in this area. Some of the non-vascular plants may be at risk leading to decrease is lichen and moss distribution and abundance. Amphibians may at risk. As well, some abnormalities have been observed in amphibians over the past twenty years, and the Canadian Toad, considered at risk in this region, has all but disappeared from the park. More study needs to be done to correlate the effects of elevated levels of PM 2.5 and O_3 on the park ecosystem. Currently we are seeking funding to inventory mosses and establish correlations with air quality. This work would be conducted through the university.

Concern regarding ecosystem integrity and the transport of human-made pollutants to pristine areas prompted Environment Canada and PCA to initiate a study involving fine PM at EINP. EINP is a rural site impacted by regional emission sources as the park is located 40 km east of the city of Edmonton, 37 km east of the Strathcona Industrial Area , otherwise known as refinery row, and 20 km southeast of numerous industrial complexes including chemical, petrochemical and fertilizer plants near Fort Saskatchewan, as well as being surrounded by prairie agricultural operations. For more information, see Bates, L., A. Treble and R. Chapman, 2002, "The answer, my friend, is blowing in the wind: assessing sources of particulate matter in Elk Island National Park," in Research Links 10(1)14-17.

FATHOM FIVE

Air issues contact. Andrew Promaine, Southwest Ontario Field Unit
Person(s) completing the questionnaire. Andrew Promaine

PROGRAMMES

MONITORING

MSC name ..... : Cove Island (AUT), #61219J2
PCA name ..... : Cove Island
Location ..... : 45.3333, -81.7333; 45°20'00"N, 81°44' 00"W; 180.7 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, pressure, dew point
Start date ..... : 1965
Ownership ..... : MSC
PCA support .... : None

RESEARCH

None

INTERPRETATION AND OUTREACH

1. Articles in local newspaper dealing with air quality issues (UV-A, UV-B, acid precipitation, etc.) as prepared by one of the park's interpretive staff.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Long term global air quality change, as identified in the Park Ecosystem Conservation Plan.
Value(s) at risk .. : General impacts on landscape and environment (no specifics)

OTHER AIR ISSUES

Issue ..... : Climate change

Value(s) impacted : Dramatically declining water levels have left shoreline access difficult. The public desire to increase length of docks, waterlines, etc., increases the overall development of the shoreline.

Value(s) at risk . . : Cumulative impacts along the shoreline, potential loss of fish habitat, potential development, etc..

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type . . . . . : Smoke, CO_2 and noise

Location of source : Water craft (boats)

Frequency . . . . . : Daily, primarily June to September

OTHER AIR ISSUE RELATED VALUES

Value . . . . . : Panoramic viewpoints of the lake

Issue(s) . . . . . : Smog/haze has greatly increased and the impacts are unknown at this point. Health warnings came as early as 4th May in 2001. Air quality is expected to be increasingly worse over time.

COMMENTS

In the past, this issue was never been deemed a priority. This is in large part due to a large degree of unknown. However, air quality in southern Ontario has become of concern due mostly to human health concerns. Unfortunately, research related to such issues, involving academic institutions or other government (federal/provincial) departments, is non-existent. The park is currently not involved in any "high level" air quality monitoring. It is, however, felt that such monitoring would be beneficial to the site and that if approached by outside agencies or groups, we would attempt to cooperatively explore development of a long term monitoring programme, aimed at specific issues such as air quality, climate change, UV radiation, smog, etc.. We are aware that there are issues, but lack the resources to adequately investigate them.

Compared to Cyprus Lake in Bruce Peninsula National Park, the Cove Island weather station is more for marine conditions and does not collect much of the winter parameters, but would collect sky condition and visibility. Cyprus is the opposite; it collects winter parameters, but not sky condition and visibility. Overall, I'd say we collected 75% of the possible parameters at each station. We hope to be meeting with the MSC soon, to ensure that we are getting the information we want that is available.

FORILLON

Personne ressource sur les enjeux atmosphériques. Jean-Guy Chavarie, Unité de la Gaspé

Personne qui remplit le questionnaire. Denis Comeau, Unité de la Gaspé

PROGRAMMES

SURVEILLANCE

Stations météorologiques

Nom APC . . . . . : Centre opérationnel
Emplacement . . . . . : 48.8569, -64.3744; 48°51'25"N, 64°22'28"O
Type et durée . . . . . : Automatisée, été seulement
Propriétés notée . . . . . : T, P, HR, VV, DV
Date de début . . . . . : 1996
Organisme(s) . . . . . : APC
Type de soutien de APC: Entretien et transfère des données

Autres stations ou programmes de surveillance de la qualité de l'air

Aucune

RECHERCHE

Projet . . . . . : Étude sur la qualité de l'air sur les campings
But . . . . . : Évaluer les effets sur les humains des particules atmosphériques libérées lors de la combustion du bois des feux sur les camping
Date de début et de fin : 1994
Organisme(s) . . . . . : APC
Type de soutien de APC: Cueillette et compilation des données

INTERPRÉTATION ET COMMUNICATIONS EXTÉRIEURES

Remarque: aucune activité spécifique d'interprétation traite des problèmes reliés aux phénomènes atmosphériques. Par contre, lors de plusieurs activités et lorsque la situation se présente, les naturalistes en font mention.

ENJEUX ATMOSPHÉRIQUES ET RESSOURCES CONNEXES

ENJEUX ATMOSPHÉRIQUES TRAITÉS DANS LES DOCUMENTS ACTUELS DE GESTION DES PARCS

Enjeu . . . . . : Réchauffement climatique
Valeur(s) touchée (s) . : Inconnu
Valeur(s) à risque . . . . : Rehaussement du niveau marin, refroidissement des eaux côtières, modification des courants marins, changement à la formation et au déplacement des glaces, augmentation de la fréquence et de l'intensité des tempêtes, inondations des basse-terres, intensification de l'érosion côtières et redistribution des sédiments, modification des taux de salinité, perte des aires de mise bas et de repos du phoque commun et du phoque gris, perte d'espèces et d'habitat rares (i.e. plantes arctiques-alpines, taïga, etc.), modification du couvert forestier, intensification des épidémies d'insectes.

AUTRES ENJEUX ATMOSPHÉRIQUES

Enjeu ..... : Amincissement de la couche d'O_3 et intensification des rayon UV-B
Valeur(s) touchée(s) .. : Inconnu
Valeur(s) à risque .... : Productivité des populations amphibiens du parc, autres, ???

IMPORTANTES SOURCES LOCALES DE POLLUTION

Aucune

VALEURS AFFECTÉES PAR LA QUALITÉ DE L'AIR

Valeur ..... : Plantes arctiques-alpines, forêt de taïga, système de dunes de Penouille, échouerie du Phoque commun et du Phoque gris, éléments spécifiques de la forêt boréale.
Enjeu(x) ..... : Réchauffement climatique

COMMENTAIRES

À l'heure actuelle, il revient à chaque parc de déterminer leurs besoins en matière de surveillance des phénomènes atmosphériques. J'imagine que la plupart des responsables de la gestion des écosystèmes sont comme moi, c'est-à-dire qu'ils n'ont pas suffisamment de connaissances en la matière pour évaluer correctement quoi surveiller et comment le faire. Ceci dit, ne serait-il pas préférable que le bureau central prenne les devants et fasse une étude des besoins pour chaque région du pays afin d'établir un véritable réseau de surveillance des enjeux atmosphériques? Cette démarche permettrait, entre autre, d'élaborer des protocols standards pour la prise de données et d'identifier les équipements appropriés pour chaque tâche. Les budgets, pour l'instauration du réseau de surveillance, pourraient être gérés par le bureau central et être alloués selon les besoins qui auront été identifiés pour chaque région et/ou parc.

FUNDY

Air issues contact. Renee Wissink, Southern New Brunswick Field Unit, T:506-887-6098
Person(s) completing the questionnaire. Renee Wissink, with updates from Ewen Eberhart and Neil Munro.

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Alma, #8100200
PCA name ..... : Alma manual
Location ..... : 45.6000, -64.9500; 45°36'00"N, 64°57'00"W; 42.7 m asl
Type and duration : Automatic, year-round

Properties recorded: T, P, sunshine, snow
Start date ..... : 1950-02-01
Ownership ..... : MSC
PCA support ... : Manual service till 1993; replaced by automatic station

MSC name ..... : Fundy Park (Alma) CS, #8101746
PCA name ..... : Fundy Alma, #FUALM
Location ..... : 45.6000, -64.9500; 45°36'00"N, 64°57'00"W; 42.7 m asl
Type and duration : Automatic (CR-10), year-round
Properties recorded: T, P, RH, WS, WD, radiation, snow depth
Start date ..... : 1993-07-01
Ownership ..... : MSC, PCA
PCA support ... : Equipment purchase, power, periodic service, data transfer lines

MSC name ..... : Wolfe Lake CS, #8105597
PCA name ..... : Wolf, #FUWFD
Location ..... : 45.6667, -65.1500; 45°40'00"N, 65°09'00"W; 304.8 m asl
Type and duration : Automatic (CR-10), year-round
Properties recorded: T, P, RH, WS, WD, radiation, snow depth
Start date ..... : 1993-07-01
Ownership ..... : MSC, PCA
PCA support .... : Equipment purchase, power, periodic service, data transfer lines

Other air monitoring stations or programmes

Name ..... : New Brunswick Precipitation Monitoring Network/Canadian Acid Precipitation Monitoring Network.
Location ..... : ???
Properties recorded: SOx and NOx deposition, pH of rain
Start date ..... : 1992
Agency(ies) .... : New Brunswick Department of Environment
PCA support .... : Protected site, power, personnel for sample collection and shipping

Name ..... : Acid Fog Monitoring Station
Location ..... : ???
Properties recorded: Chemistry and acidity including mercury and other metals
Start date ..... : 1991
Agency(ies) .... : CFS
PCA support .... : Site, personnel for sample collection, access to data logger

RESEARCH

Project ..... : Mercury in loons and fish
Purpose ..... : Impacts on loon and chick health, behavioural patterns, and reproduction, in response to mercury levels measured in blood.

Start and end dates : 1995 - 1997
Agency(ies) .... : Environment Canada
PCA support .... : Logistics, personnel if required

Project ..... : Mercury in fish
Purpose ..... : Assess level of mercury in sportfish and risk to public health if consumed
Start and end dates : 1994
Agency(ies) .... : Department of Fisheries and Oceans, New Brunswick Departments of Natural Resources and Health.
PCA support .... : Collection of samples

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Airborne/atmospheric pollutants
Value(s) impacted : Loon reproduction, Atlantic salmon
Value at risk .... : Forest habitat, aquatic habitat and primary productivity in forest stands

Issue ..... : Acid precipitation/fog
Value(s) impacted : ???
Value at risk .... : Amphibian populations, forest vegetation, aquatic habitat and rate of decomposition in forest stands.

Issue ..... : Climate change
Value(s) impacted : ???
Value at risk .... : Floral and faunal species composition

Issue ..... : Ground level ozone
Value(s) impacted : Birch
Value at risk .... : Ecosystem integrity and decline of birch species

OTHER AIR ISSUES
Issue ..... : UV-B
Value(s) impacted : Amphibian populations, vegetation, wildlife, primary producers
Value(s) at risk .. : ???

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES

Value ..... : Amphibian populations, particularly rare salamanders such as the Four-toed salamander (*Hemidactylium scutatum*) and Dusky salamander (*Desmognathus fuscus*).
Issue(s) ..... : Climate change, UV-B, acid precipitation

Value ..... : Birch population
Issue(s) ..... : O_3

Value ..... : Loon reproduction
Issue(s) ..... : Mercury levels in prey (brook trout)

Value ..... : Endangered Atlantic salmon populations
Issue(s) ..... : Mercury, airborne pollutant deposition resulting in eutrophication

Value ..... : Visitor health
Issue(s) ..... : O_3 spikes during visitor season

COMMENTS

In addition to the programmes noted earlier, the Park has a system of 34 permanent forest sample plots dating back to 1975, and five modified Smithsonian Institute/Man and Biosphere plots which could play a role in assessing ecological responses to air quality and climate change. Proposals which have not been implemented due to lack of funding include utilizing same for monitoring primary productivity and rate of decomposition which can be impacted by air related factors. Other currently measured parameters in these plots may also have potential for evaluating impacts. Our partners involved in climate, acid precipitation, acid fog, and ozone monitoring consider the Fundy site highly valuable for these programmes due to its geographic location in relation to pollutant sources and air movement. At the same time, they benefit the Park's ecosystem integrity monitoring programme directly as important components of our monitoring strategy. However, our inability to provide adequate resource levels to continue many monitoring efforts has resulted in a loss of credibility with many of our partners.

GEORGIAN BAY ISLANDS

Air issues contact. Tim Sweeting, Central Ontario Field Unit
Person(s) completing the questionnaire. Tim Sweeting

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Beausoleil, #6110617
PCA name ..... : Beausoleil Island, #GBWPB
Location ..... : 44.8500, -79.8667; 44°51'00"N, 79°52'00"W; 183.0 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P (rain and snow), RH, WS, WD
Start date ..... : 1974-01-10 (#6113490); 1992-March-09 station moved about 100 m and became automated.
Ownership ..... : MSC
PCA support .... : Data transfer lines, maintenance support

Other air monitoring stations or programmes
None

RESEARCH
Project ..... : pH levels of ephemeral ponds and herptiles
Purpose ..... : Effects of elevated pH rainfall on herptile populations
Start and end dates : 1989 - 1995, 2001
Agency(ies) .... : PCA
PCA support .... : Park staff complete project

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

None. The Park Management Plan states that the park is monitoring development in the area and will be aware of any forthcoming issues which could affect air quality in the park and region.

OTHER AIR ISSUES

Air issue ..... : Acid precipitation
Value(s) impacted : ???
Value(s) at risk .. : Herptile populations, sensitive forest species

Air issue ..... : Mercury levels
Value(s) impacted : ???
Value(s) at risk .. : fish, fish eating birds and mammals

Air issue ..... : UV radiation
Value(s) impacted : ???
Value(s) at risk .. : Rare plant species, Monarch Butterfly

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES
None

COMMENTS

The park lies downwind of North American pollution emission source regions, and gets a relatively large deposition of airborne pollutants that impact lakes, streams and vegetation. The pollutants having the most significant impact are sulphates and nitrogen oxides. Since the park's geology, soils and water tend to be naturally acidic and poorly buffered, the cumulative effects of acid rain can be significant to aquatic and terrestrial ecosystems.

GLACIER NATIONAL PARK

Air issues contact. Bill Browne, Mount Revelstoke/Glacier Field Unit
Person(s) completing the questionnaire. Bill Browne

PROGRAMMES

MONITORING

Weather stations
Avalanche control

MSC name	:	Glacier NP Mt Fidelity, #117CA90
PCA name	:	Fidelity
Location	:	51.2364, -117.7180; 51°14'11"N, 117°43' 03"W; 1874.5 m asl
Type and duration	:	Automatic, year-round, plus manual records collocated???
Properties recorded	:	T, P, RH, WS, WD, temperature extremes, pressure and pressure trend, sky condition, precipitation type, rate and amount, temperature trend, snowfall amounts, new snow density, snow pack height, snow shear qualities, snow penetrability, snow crust properties.
Start date	:	1961
Ownership	:	PCA (Highway Service Centre), MSC
PCA support	:	Mostly PCA. MSC has provided basic equipment such as thermometers and rain gauge.

MSC name	:	Glacier NP Rogers Pass, #1173191
PCA name	:	Rogers Pass, #GLRGR
Location	:	51.3024, -117.5155; 51°18'09"N, 117°30'56"W; 1322.8 m asl
Type and duration	:	Automatic, year-round, plus manual records collocated???
Properties recorded	:	T, RH, WS, WD, temperature extremes, pressure and pressure trend, sky condition, precipitation type rate and amount, temperature trend,

snowfall amounts, new snow density, snow pack height, snow shear qualities, snow penetrability, snow crust properties.
Start date ..... : 1965-06-01
Ownership ..... : PCA (Highway Service Centre), MSC
PCA support .... : Mostly PCA. MSC has provided basic equipment such as thermometers and rain gauge.

PCA name ..... : Glacier Station
Location ..... : 51.2700, -117.5086; 51°16'12"N, 117°30'31"W
Type and duration : Manual, year-round
Properties recorded: T, P, RH, snowfall, snow pack
Start date ..... : Early 1900s
Ownership ..... : PCA (Highway Service Centre)
PCA support .... : All

PCA name ..... : Heather Hill
Location ..... : 51.4460, -117.4754; 117.51°26'46"N, 117°28'32"W
Type and duration : Automatic, seasonal
Properties recorded: T, RH, soil temperature, soil water temperature, snow pack temperatures, road surface temperature, road conductivity.
Start date ..... : 2000-??-??
Ownership ..... : PCA (Highway Service Centre)
PCA support .... : All

PCA name ..... : Hermit
Location ..... : 51.3291, -117.5222; 51°19'45"N, 117°31'20"W
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1977-??-??
Ownership ..... : PCA (Highway Service Centre)
PCA support .... : All

PCA name ..... : MacDWSh
Location ..... : 51.3073, -117.5014; 51°18'26"N, 117°30'05"W
Type ..... : Automatic, seasonal
Properties recorded: T, RH, WS, WD
Start date ..... : 1961-??-??
Ownership ..... : PCA
PCA support .... : All

PCA name ..... : Mount Abbott
Location ..... : 51.2543, -117.5104; 51°15.258' N, 117°30'38"W
Type and duration : Manual, seasonal
Properties recorded: T, P, RH, snowfall, snow pack
Start date ..... : 1961-??-??
Ownership ..... : PCA (Highway Service Centre)

PCA support .... : All

PCA name ..... : Roundhill
Location ..... : 51.2350, -117.7085; 51°14'06"N, 117°42'31"W
Type and duration : Automatic, seasonal
Properties recorded: T, RH, WS, WD, pressure
Start date ..... : 1963-??-??
Ownership ..... : PCA (Highway Service Centre)
PCA support .... : All

Fire control
PCA name ..... : Beaver Valley East Gate, #GLLBE (Lower Beaver)
Location ..... : 51.4160, -117.4600; 51°24'58"N, 117°27'36"W; 853.0 m asl
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : All

PCA name ..... : Beaver Valley Upper Site, #GLUBE (Upper Beaver)
Location ..... : 51.3083, -117.3728; 51°18'30"N, 117°22'22"W; 1524.0 m asl
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : All

PCA name ..... : Fidelity Mountain, #GLFID
Location ..... : 51.0235, -118.2055; 51°01'25"N, 118°12'20"W; 1219.0 m asl
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : All

PCA name ..... : Mountain Creek, #GLMCK
Location ..... : 51.4569, -117.5264, 51°27'25"N, 117°31'35"W; 1560.0 m asl
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1998-??-??
Ownership ..... : PCA
PCA support .... : All

Glacier monitoring
PCA name ..... : Lookout
Location ..... : 51.2316, -117.4508; 51°13'54"N, 117°27'03"W

Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, radiation
Start date ..... : 1998-??-??
Ownership ..... : PCA
PCA support .... : All

Landslide watch
PCA name ..... : Rockfall
Location ..... : 51.4323, -117.4369; 51°25'56"N, 117°26'13"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1999-??-??
Ownership ..... : PCA (Highway Service Centre and Warden Services)
PCA support .... : All

Water supply - BC Hydro
PCA name ..... : Fidelity
Location ..... : 51.2368, -117.7001; 51°14'12"N, 117°42'00"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH
Start date ..... : ???
Ownership ..... : British Columbia Hydro
PCA support .... : Occasional

PCA name ..... : Glacier Station
Location ..... : 51.2700, -117.5086; 51°16'12"N, 117°30'31"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH
Start date ..... : ???
Ownership ..... : British Columbia Hydro
PCA support .... : Occasional

Other air monitoring stations or related programmes
Avalanche
PCA name ..... : Cougar
Location ..... : 51.2632, -117.5708; 51°15'47"N, 117°34'15"W
Type and duration : Automatic, seasonal
Properties recorded: Avalanche event
Start date ..... : 1997-??-??
Agency(ies) .... : PCA (Highway Service Centre)
PCA support .... : All

PCA name ..... : Tupper
Location ..... : 51.3248, -117.4790; 51°19'29"N, 117°28'44"W
Type and duration : Automatic, seasonal
Properties recorded: Avalanche event

Start date ..... : 1999-??-??
Agency(ies) .... : PCA (Highway Service Centre)
PCA support .... : All

Glacier monitoring
PCA name ..... : Illecillewaet Stream
Location ..... : 51.2629, -117.4903; 51°15'46"N, 117°29'25"W
Type and duration : Automatic, seasonal
Properties recorded : Stream level, stream conductivity
Start date ..... : 2000-??-??
Agency(ies) .... : PCA
PCA support .... : All

PCA name ..... : Perley Lake
Location ..... : 51.2446, -117.4380; 51°14'41"N 117°26'17"W
Type and duration : Automatic, seasonal
Properties recorded : Lake level
Start date ..... : 2000-??-??
Agency(ies) .... : PCA
PCA support .... : All

RESEARCH
None

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS
None

OTHER AIR ISSUES
Issue ..... : Climate change
Values at risk ... : Unclear, but more variable weather patterns via climate change could result in more frequent fires. Warming climate could stress trees, leading to more disease, more fuels and greater likelihood of loss of old-growth and old-growth dependent species such as mountain caribou, red-listed, and already at risk from forestry and recreation (mostly snowmobiling).

Issue ..... : LRTAP. Work in progress on contaminants (DDT/DDE, toxaphene) in high elevation lakes in nearby Mount Revelstoke National Park may indicate similar risk here.
Values at risk ... : Human health, fish and avian predators (osprey).

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Industry - PM 10, from beehive burners, lumber mill
Location of source : Revelstoke and Downie beehive burners, Golden pulp mill
Frequency ..... : Ongoing, although worse in winter

Type ..... : Through traffic
Location of source : Golden railway yards, railway and highway through the park
Frequency ..... : Ongoing, although worse in winter

Type ..... : Domestic wood stoves and furnaces - PM 10
Location of source : Golden and Revelstoke
Frequency ..... : Ongoing, although worse in winter

Type ..... : Biomass burning - PM 10, dust and smoke
Location of source : Regional
Frequency ..... : Spring and Fall

Type ..... : Dust - from reservoir drawdown
Location of source : Reservoir
Frequency ..... : Spring and Fall

Together the above sources result in high PM 10 levels that frequently exceed human health objectives for "poor" (50-100) in Golden, particularly during the Fall to Spring period (based on continuous monitoring), and occasionally in Revelstoke (based on intermittent monitoring: 24 hours every 6 days).

If funding is obtained to install a continuous sampler (Tapered Element Oscillating Microbalance) in Revelstoke, sufficient data will become available to issue health advisories and develop an airshed management plan for the Revelstoke area. The Mount Revelstoke and Glacier National Parks Field Unit is offering $1,500 of the $10,000 operational costs and will become a partner with the British Columbia Ministry of Environment, Lands and Parks if the remainder of the funds is provided by other potential partners (i.e. City of Revelstoke).

AIR ISSUE RELATED VALUES

Value ..... : Old-growth forests and species
Air issue ..... : Climate change

Value ..... : Human health, viability, aesthetics
Air issue ..... : Fine particulate pollution from local sources in Revelstoke and Golden

Value ..... : Contaminants in fish and avian consumers
Air issue ..... : LRTAP

COMMENTS

Air quality within MRGNP is not significantly affected by local sources of air pollution, such as beehive burners, wood smoke from stoves, diesel fuel from trucks and rail cars, prescribed burning etc.. Local air pollution sources are causing elevated PM 10 levels in adjacent communities of Golden and Revelstoke which are of concern in terms of human health. Climate change with the resultant potential for an increased drought, fuel build-up, and increased catastrophic fire is a major issue in terms of old-growth forest loss and the potential extirpation of species such as red-listed mountain caribou. LRTAP such as pesticides is affecting containment levels in fish populations in high elevation lakes.

GRASSLANDS

Air issues contact. Pat Fargey, Grasslands National Park Field Unit
Person(s) completing the questionnaire. Robert Sissons and Adrian Sturch, Grasslands National Park Field Unit

PROGRAMMES

MONITORING

Weather stations

PCA name ..... : East Block (McGowan's)
Location ..... : 49.0679, -106.5194; 49°04'04"N, 106°31'10"W
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, ground temperature, photosynthetically active radiation, fire weather index data.
Start date ..... : 1998-11-??
Ownership ..... : Environment Canada (EMAN)
PCA support .... : Some service, some hardware

PCA name ..... : West Block
Location ..... : 49.1167, -107.9667; 49°07'00"N, 107°58'00"W
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, ground temperature, fire weather index data
Start date ..... : 1994-05-??
Ownership ..... : MSC
PCA support .... : Some hardware

Other air monitoring stations or programmes

None

RESEARCH

Project ..... : N deposition in western national parks with special reference to Elk Island National Park.
Location ..... : Western national parks
Purpose ..... : Determined the amounts of aerially deposited N
Start and end dates : Completed; found GNP to have the 2nd highest levels of N deposition in the six prairie parks studied.

Agency(ies) .... : University of Regina, Department of Biology
PCA support .... : Financial

Project ..... : Dynamics of C3 and C4 productivity in northern mixed grass prairie
Location ..... : Grasslands National Park
Purpose ..... : Determine the effect of atmospheric and climate change on C3 and C4 productivity in northern mixed grass prairie.
Start and end dates : Thesis completed 1997
Agency(ies) .... : University of Toronto, Department of Geography
PCA support .... : Technical/logistical

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : N deposition
Value(s) impacted : Increase of exotic plants (fertilizer effect)
Value(s) at risk .. : All native species

Issue ..... : Climate change
Value(s) impacted : Change in plant communities (increased drought)
Value(s) at risk .. : All dependent species

Issue ..... : O_3 depletion
Value(s) impacted : May affect amphibians and lightly pigmented species
Value(s) at risk .. : Sensitive species

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
Pollution type ... : Pesticides
Location of source : Agricultural areas surrounding GNP
Frequency ..... : Seasonal, frequent

Pollution type ... : Fertilizers
Location of source : Agricultural areas surrounding GNP
Frequency ..... : Seasonal, frequent

OTHER AIR ISSUE RELATED VALUES
None

COMMENTS

There has been discussion about setting up a programme in prairie parks to monitor specific pesticides in precipitation.

GROS MORNE

Air issues contact. Tom Knight, Western Newfoundland and Labrador Field Unit
Person(s) completing the questionnaire. Tom Knight

PROGRAMMES

MONITORING

Weather stations

PCA name ..... : Big Level, Gros Morne National Park of Canada (GMNP)
Location ..... : 49.7000, -57.7667; 49°42'00"N, 57°46'00"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, radiation, snow depth, ground temperature
Start date ..... : 1993-??-??
Ownership ..... : Memorial University of Newfoundland, GMNP
PCA support .... : Equipment purchase, logistics, servicing
Problems occurring at Big Level weather station: animals damaging electrical connections; severe wind and ice damaging anemometer.

MSC name ..... : Rocky Harbour CS, #8403097
PCA name ..... : Rocky Harbour
Location ..... : 49.5750, -57.8750; 49°34'30"N, 57°52'30"W; 67.7 M asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1972
Ownership ..... : MSC
PCA support .... : Maintenance

Other air monitoring stations or programmes

Name ..... : LRTAP
Location ..... : Six locations scattered through GMNP
Properties recorded: Water quality - colour, specific conductance, TOC/DOC, Al, Mn, Fe, Acid Neutralization Capacity, pH, NO_2-NO_3, Total Nitrogen, SO_4, Ca, Mg, Cl, Na, K.
Start date ..... : 1983
Agency(ies) .... : Environment Canada, PCA
PCA support .... : Sample collection

RESEARCH

Project ..... : Assessing chemical pollutant deposition and its impacts on alpine ecosystems.
Purpose ..... : Following seasonal mass and chemical loading released from the snow pack to headwater streams.

Start and end dates : 1996 - ongoing
Agency(ies) .... : Memorial University of Newfoundland, GMNP
PCA support .... : Funding, logistical support

INTERPRETATION AND OUTREACH

1. Air quality is briefly discussed in some of the interpretive programs
2. Air Quality Issues pamphlet is distributed to visitors

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Garbage burning at Lomond and Rocky Harbour landfill sites
Value(s) impacted : Local air quality
Value(s) at risk .. : Local air quality

OTHER AIR ISSUES

Issue ..... : Snowmobile exhaust
Value(s) impacted : Backcountry experience
Value(s) at risk .. : Water quality

Issue ..... : Acid precipitation
Value(s) impacted : High-altitude lake chemistry
Value(s) at risk .. : Fish, invertebrate, and plant populations within lakes. Loss of habitat for northern and arctic species.

Issue ..... : Climate change
Value(s) impacted : ???
Value(s) at risk .. : Northern and Arctic species limited to high-altitude zones in the park (e.g. arctic hare, arctic char, rock ptarmigan).

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Pesticides, *Bacillus thuringiensis* from adjacent forestry
Location of source : Forestry districts surrounding park
Frequency ..... : Each year some areas are sprayed

Type ..... : Industrial output
Location of source : Corner Brook Pulp and Paper, Cornerbrook
Frequency ..... : Daily production, likely minimal impacts on GMNP

Type ..... : Burning of garbage in local landfills
Location of source : Lomond landfill, Rocky Harbour landfill
Frequency ..... : Weekly

AIR ISSUE RELATED VALUES

Value ..... : High elevation fish populations
Air issue(s) ..... : Acid deposition

Value ..... : Plant communities of late snow beds
Air issue(s) ..... : Acid deposition

Value ..... : Northern and arctic species limited to high-altitude zones in the park, e.g. Arctic hare, Arctic char, rock ptarmigan, rare vascular plants.
Air issue(s) ..... : Acid deposition and climate change may reduce limited habitat for these species.

COMMENTS

Acid precipitation is a significant regional concern. There have been anecdotal observations of rapid snow melt that resulted in acid shock to shallow ponds and mortality of fish. Overall, pH in ponds is improving according to LRTAP data, but acid shock events may be the most important consideration ecologically. This is currently being studied.

In the Ecological Integrity Statement and Park Management Plan, a goal is to "mitigate the effects of long-range transported pollutants." Actions:

- Document all potential sources of long-range pollution, and to establish monitoring protocols.
- Conduct studies to ascertain the ecological effects of long-range transported pollutants.
- Indicators of success: the effects of long-range transported pollutants are communicated to national and international audiences; the effects of long-range transported pollutants are mitigated.

Research on long-range transported pollutants is being done in collaboration with Environment Canada (collect samples for LRTAP) and Memorial University of Newfoundland (research on climate change and acid shock).

GWAII HAANAS

Air issues contact. Norm Sloan, Gwaii Haanas Field Unit
Person(s) completing the questionnaire. Norm Sloan

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Cape St James CS, #1051351
Location ..... : 51.9358, -131.0160; 51°56'09"N, 131°00'59"W; 91.9 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, WS, WD, pressure
Start date ..... : 1992-09-01; earlier stations on the site may date to 1913
Ownership ..... : MSC
PCA support .... : None

Other air monitoring stations or programmes

None

RESEARCH
None

INTERPRETATION AND OUTREACH
Gwaii Haanas is very committed to marine weather information to park visitors and issues a visitor handbook with the relevant information.

AIR ISSUES AND RELATED VALUES
AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS
Issue ..... : Climate change
Values at risk ... : Alpine endemic plants in the glacial refugium areas. Salmonids; both adults avoiding warm oceanic waters in their landward spawning migrations and possible mortalities of their young in creeks that become too warm. Ocean ecology in the North Pacific.

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES
None

COMMENTS
Air quality is not a problem here. However, climate change is considered to be an issue. Indeed, the tree line in Gwaii Haanas is a good measure of climate change. Please see Research Links 8(3):14-17, 2000 for an article by Marlow Pellatt, and his papers cited on that issue from Haida Gwaii. Of course, we do not have a marine park component yet.

IVVAVIK
Air issues contact. Ian McDonald, Western Arctic Field Unit
Person(s) completing the questionnaire. Ian McDonald

PROGRAMMES
MONITORING
Weather stations
MSC name ..... : Margaret Lake, #2100697
PCA name ..... : Margaret Lake
Location ..... : 68.8006, -140.8480; 68°48'02"N, 140°50'51"W; 524.5 m asl
Type and duration : Automatic, year-round

Properties recorded: T, P, RH, WS, WD, incoming shortwave radiation (RF1), relative humidity, dew point, snow fall and depth, barometric and vapour pressure.
Start date ..... : 1997-06-09
Ownership ..... : PCA
PCA support .... : Purchase and installation, routine service, data transfer

MSC name ..... : Ivvavik Nat. Park, #2100660
PCA name ..... : Sheep Creek
Location ..... : 69.1644, -140.1500; 69°09'52"N, 140°09'00"W; 301.8 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, incoming shortwave radiation (RF1), relative humidity, dew point, snow fall and depth, barometric and vapour pressure, UV-B radiometer.
Start date ..... : 1995-06-11
Ownership ..... : PCA
PCA support .... : Purchase and installation, routine service, data transfer

The following station is in a former military enclave that is being taken over by PCA
MSC name ..... : Komakuk Beach, #2100682
Location ..... : 69.6199, -140.1970; 69°36'43"N, 140°11'49"W; 13.2 m asl
Type and duration : Automatic, year-round
Properties recorded: T, RH, WD, WS, pressure, sky conditions, visibility (miles), weather and obstructions to vision, pressure, cloud amount and/or obscuring phenomena.
Start date ..... : 1992-06-10
Agency ..... : Department of National Defence
PCA support .... : None

Other air monitoring stations or programmes
None

RESEARCH
None

INTERPRETATION AND OUTREACH
1. Annual research and monitoring report, 1999 and 2000. Western Arctic Field Unit.
2. Environmental Stewardship Program. Western Arctic Field Unit.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : Habitat (e.g. vegetation, permafrost, etc.) and wildlife
Value(s) at risk .. : ???

Issue ..... : LRTAP
Value(s) impacted : ???
Value(s) at risk .. : Water quality, wildlife and habitat, human health

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES
Value ..... : Permafrost
Air issue(s) ..... : Climate change, coastal erosion

Value ..... : Coastal plain habitat
Air issue(s) ..... : Climate change, vegetation change

Value ..... : Water quality
Air issue(s) ..... : LRTAP

COMMENTS
None

JASPER
Air issues contact. Shawn Cardiff, Jasper National Park Field Unit
Person(s) completing the questionnaire. Shawn Cardiff

PROGRAMMES
MONITORING
Weather stations
MSC name ..... : Devona, #3052069
PCA name ..... : Devona, #JADE2
Location ..... : 53.1700, -118.0300; 53°10'12"N, 118°01'48"W; 1403.6 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1997
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, routine service, data transfer

MSC name ..... : Jasper East Gate, #3063523
Location ..... : 53.2333, -117.8170; 53°14'00"N, 117°48'00"W; 1002.8 m asl
Type and duration : ???
Properties recorded: T, P

Start date ..... : 1971-01-01
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Jasper Warden, #3053536
PCA name ..... : Jasper Warden Office, #JAWJW, at the old Jasper Warden office
Location ..... : 52.9500, -118.0100; 52°57'00"N, 118°00'36"W; 1020.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, radiation
Start date ..... : 1988-11-25
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, routine service, data transfer

MSC name ..... : Jasper West Gate, #3053538
Location ..... : 52.8667, -118.3830; 52°52'00"N, 118°23'00"W; 1127.8 m asl
Type and duration : ???
Properties recorded: T, P
Start date ..... : 1974-07-01
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Marmot Basin, #305421B
Location ..... : 52.6833, -118.1000; 52°41'00"N, 118°06'00"W; 2072.0 m asl
Type and duration : ???
Properties recorded: ???
Start date ..... : 1983-09-01
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Marmot Triple, #3054215
Location ..... : 52.7000, -118.1170; 52°42'00"N, 118°07'00"W; 2290.0 m asl
Type and duration : ???
Properties recorded: T, P
Start date ..... : 1998-10-31
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Parker Ridge, #3054998
Location ..... : 52.2000, -117.1333; 52°12'00"N, 117°08'00"W; 2023.0 M asl
Type and duration : ???, winter
Properties recorded: T, P
Start date ..... : 1978-01-01; precursor station #3054997 back to 1974-12-01
Agency ..... : ???
PCA support .... : ???
This may be the same station as Parker Ridge Lower, see below.

PCA name ..... : Parker Ridge Lower, #JAPAL, Parker Ridge Snow Study plot
Location ..... : 52.1900, -117.0100; 52°11'24"N, 117°00'36"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, snow depth
Start date ..... : 1999
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, routine service, data transfer

MSC name ..... : Upr Parker Ridge, #3056657
PCA name ..... : Parker Ridge Upper, #JAPAU
Location ..... ; 52.0100, -117.0900; 52°00'36"N, 117°05'24"W; 2317.0 m asl
Type and duration : Automatic, year-round
Properties recorded; T, RH, WS, WD
Start date ..... : 1998-10-31
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, routine service, data transfer

MSC name ..... : Sunwapta, #3056272
PCA name ..... : Sunwapta, #JASU2, at the Sunwapta Warden Station
Location ..... : 52.4500, -117.4400; 52°27'00"N, 117°26'24"W; 1554.5 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1979-09-01
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, routine service, data transfer

MSC name ..... : Willow Creek, #306GE70
PCA name ..... : Willow Creek, #JAWWO, at the Willow Creek Warden Station
Location ..... : 53.3900, -118.3500; 53°23'24"N, 118°21'00"W; 1402.1 m asl
Type and Duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1993-07-01
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, routine service, data transfer

Other air monitoring stations or programmes
Name ..... : ATCO Electric
Location ..... : Jasper Palisades Generating Station
Properties recorded: NOx, O, CO_2, N, H_2O, average gas temperature and velocity
Start date ..... : 1986-07-??
Agency(ies) .... : ATCO Electric (Alberta Power Limited)
PCA support .... : None

RESEARCH
Project ..... : Delayed deposition of organochlorine pesticides at a temperate glacier (Snowdome).

Purpose ..... : To repeat sampling previously conducted in 1995, and film a segment for "Sacred Balance," a David Suzuki film.
Start and end dates : 2001-10-15 to 2001-10-18
Agency(ies) .... : Environment Canada, Ecological Research Division
PCA support .... : Warden assistance for public safety

Project ..... : Air and ground temperatures for permafrost sites
Purpose ..... : To study permafrost and associated air temperatures between Claresholm and central Yukon territory; locations in national parks include Bow Summit, Parker Ridge, Marmot Basin.
Start and end dates : Various permits, 1996-2001
Agency(ies) .... : University of Calgary
PCA support .... : None

Project ..... : Persistent organic pollutants in wildlife
Purpose ..... : Determine persistence of air-transported contaminants in wildlife receptors, specifically fish and osprey.
Start and end dates : 1999-04-06 to 1999, possibly renewed in 2000 and 2001
Agency(ies) .... : Environment Canada (Canadian Wildlife Service)
PCA support .... : Field logistics, egg collection in Banff, Jasper and Waterton Lakes

Project ..... : Lake sediment cores for organochlorine and heavy metal analysis
Purpose ..... : Examine lake bottom sediments for long-range air-transported contaminants
Start and end dates : 1999-04-06 to 1999-04-30
Agency(ies) .... : University of Alberta
PCA support .... : None

INTERPRETATION AND OUTREACH

1. For prescribed fire events, advisories are issued for people with respiratory problems, and visibility cautions for highway traffic, via print media, radio, telephone hot lines, and roadside signage.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

The following information originates with the Jasper National Park of Canada Management Plan and Draft Ecosystem Conservation Strategy.

Issue ..... : Campfire smoke in Whistler and Wapiti campgrounds in summer, especially during winter temperature inversions.
Value(s) impacted : Human health and aesthetics
Value(s) at risk .. : Human health and aesthetics

Issue ..... : Global transport of air pollution
Value(s) impacted : Discernible effect on water quality and perhaps on biota in park lakes
Value(s) at risk .. : Fish, osprey

Issue ..... : Fossil fuel emissions around the community of Jasper
Value(s) impacted : Human health and aesthetics
Value(s) at risk .. : Human health and aesthetics

Issue ..... : Light pollution
Value(s) impacted : Aesthetics, night sky enjoyment
Value(s) at risk .. : Human health and aesthetics

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
Type ..... : Odour, pulp mill emissions
Location of source : Hinton, Alberta
Frequency ..... : Occasional (a few occurrences over several months), typically occurs with east wind & supporting weather conditions.

Type ..... : Slash burning
Location of source : British Columbia
Frequency ..... : Occasional, depending on forestry operations, primarily in Autumn

Type ..... : Campfire smoke
Location of source : Whistlers and Wapiti Campground
Frequency ..... : Periodic through the summer

Type ..... : Fossil fuel emissions
Location of source : Town site, Columbia Icefield Centre
Frequency ..... : Periodic through the summer; exacerbated with winter temperature inversion conditions

Type ..... : Fossil fuel emissions (natural gas and diesel)
Location of source : Palisades generating station
Frequency ..... : Year-round

AIR ISSUE RELATED VALUES
Value ..... : Expectations for wilderness experience: clean fresh air
Air issue(s) ..... : Occasional odour from Hinton pulp mill

Value ..... : Expectations for clean fresh air
Air issue(s) ..... : Vehicle emissions at day-use visitor nodes, transportation nodes and town site.

Value ..... : Opportunities for night sky viewing
Air issue(s) ..... : Light pollution in town, bungalow camps, campfire smoke in campgrounds

COMMENTS

Airflow systems affecting JNP are predominantly westerly from British Columbia. Air quality concerns from the region to the west are limited due to the relatively low levels of emission-producing industrial activities. Slash burning from forestry operations is a seasonal concern affecting visibility and odour. Higher levels of industrial activity occur in the foothills of Alberta, associated with forestry, mining, and oil and gas operations. Detectable and predominant among the potential effects of those activities are occasional odours from the pulp mill in Hinton. At a global scale, long-range transport of contaminants and retention in alpine glacial-hydrological systems has been documented and is of concern. JNP is a member of the Parkland Airshed Management Zone Association, although our participation has been minimal.

The JNP Management Plan and Draft Ecosystem Conservation Strategy identify park concerns with respect to air quality and climate. Air quality issues appear to be limited but include heavy concentrations of campfire smoke in Whistler and Wapiti campgrounds in summer and occasional, but noticeable, concentrations of fossil fuel emissions around the community, especially during winter temperature inversions. The latter stem from both highway vehicles and railway locomotives. A limited study was done recently on campfire smoke but no regular monitoring of air quality is done. Global transport of air pollution has a discernible effect on water quality and perhaps on biota in park lakes. Long distance transport of atmospheric pollutants has been detected in park waters and glaciers.

In addition to air quality concerns, inappropriate lighting is of increasing concern as light pollution interferes with opportunities to view the night sky and with other ecosystem functions.

Monitoring of climate in the park is currently minimal with five permanent stations (Jasper town site, Devona, Sunwapta, Parker Ridge, Willow Creek). Temporary weather stations are established in the vicinity of prescribed fire sites for usually one to two summer seasons previous to a fire. A limited number of climatic variables are monitored at the permanent and temporary sites; usually only temperature, humidity, precipitation, and wind speed and direction. Given the great variation in climate in the park due to altitude, topography (aspect, slope position, etc.), precipitation shadow effects, and distance from the Continental Divide, the current stations represent only a small portion of the climate of the park.

The information from the permanent sites becomes part of the MSC climate database. Climate information for the park was summarised in 1977 but there is no periodic analysis done to detect climatic changes that may be occurring in the park.

While the park cannot directly influence many of the external drivers of climate change, it is important that climate within the park be monitored in order to understand the changes that are occurring. Climate and weather information is also important for managing and forecasting fire and avalanche activity. The current climate network is used for fire and avalanche management purposes as well as characterising the climate of small portions of the park. Support for this network is minimal and intermittent.

Over the next century, summers in JNP are predicted to be warmer by 4-6° and drier than now, while winters will also be warmer by 4-6 ° and slightly wetter. These changes will profoundly affect ecosystem composition, structure and processes. For example, river flow regimes, lake levels and glacial ice will be affected. Processes such as fire, insect and disease outbreaks and decomposition will change, and species will be affected as habitats, competitive relationships and weather change. JNP has no programme to assess these predicted changes and to develop an appropriate management response.

KEJIMKUJIK

Air issues contact. Cliff Drysdale, Mainland Nova Scotia Field Unit
Person(s) completing the questionnaire. Chris McCarthy, Mainland Nova Scotia Field Unit, with update from Neil Munro.

PROGRAMMES

MONITORING

Weather stations

MSC name	:	Kejimkujik 1, #8202592
PCA name	:	Kejimkujik National Park Weather Station, #KEDLY
Location	:	44.4367, -65.1737; 44°26'12"N, 65°10'25"W; 126.5 m asl
Type and duration	:	Automatic, year-round, plus fire weather index and fire behaviour prediction daily from mid-April to mid-October.
Properties recorded	:	T, P, RH, WS, WD
Start date	:	1966-??-??
Ownership	:	MSC, PCA
PCA support	:	Site protection, security, power, communication lines, data collection

Other air monitoring stations or programmes

Name	:	LRTAP
Location	:	44.4367, -65.1737; 44°26'12"N, 65°10'25"W; 126.5 m asl
Type and duration	:	Continuous collection
Properties recorded	:	pH, ions, heavy metals
Start date	:	1978
Agency(ies)	:	Canadian Wildlife Service, Environment Canada, Kejimkujik Resource Conservation.
PCA support	:	Staff, site protection, security, clerical and logistical support

Name	:	Water Quality Monitoring
Location	:	Various locations
Type and duration	:	Twice annually (May and October)
Properties recorded	:	Mersey River flow rate, Kejimkujik Lake levels
Start date	:	1967-??-??
Agency(ies)	:	Environment Canada
PCA support	:	Site protection, security, clerical and logistical support

Name ..... : Smithsonian/Man and Biosphere forest biodiversity plots
Location ..... : Various plots inside and outside park (both private lands and crown owned)
Type and duration : Ongoing maintenance; renewed census every 5 years
Properties recorded: Microclimate conditions within forest canopy and soil
Start date ..... : 1996-??-??
Agency(ies) .... : Smithsonian Institute, Kejimkujik Resource Conservation
PCA support .... : Site protection, security, power, clerical and logistical support, proponent

Name ..... : Biogeochemical cycling of contaminants in loons
Location ..... : Park at large
Properties recorded: Opportunistic blood analysis and reproduction
Start date ..... : 1988-??-??
Agency(ies) .... : Kejimkujik Resource Conservation, Canadian Wildlife Service
PCA support .... : Proponent

Name ..... : CAPMoN (Canadian Air and Precipitation Monitoring Network)
Location ..... : 44.4367, -65.1737; 44°26'12"N, 65°10'25"W; 126.5 m asl
Properties recorded: Daily sampling of air and precipitation to determine chemical composition and wet and dry deposition of particulate matter, in particular, sulphur and nitrogen compounds.
Start date ..... : 1983-??-??
Agency(ies) .... : Environment Canada
PCA support .... : Site protection, security, power, communication lines, clerical and logistical support.

Name ..... : Canadian Acid Aerosol Measurement Programme
Location ..... : 44.4367, -65.1737; 44°26'12"N, 65°10'25"W; 126.5 m asl
Properties recorded: Acidity and fraction of aerosol mass
Start date ..... : 1992
Agency(ies) .... : Environment Canada, Health Canada
PCA support .... : Site protection, security, clerical and logistical support

RESEARCH

Project ..... : Ecological Monitoring and Assessment Network
Purpose ..... : To maintain national integrated forest monitoring sites to function as centres of interdisciplinary and integrated research.
Start and end dates : 1993-ongoing
Agency(ies) .... : Environment Canada, Kejimkujik Ecosystem Science Centre
PCA support .... : Proponent, site protection, security, clerical and logistical support

INTERPRETATION AND OUTREACH

1. Dark Waters - Kejimkujik NP - an interpretive pamphlet which outlines details on "acid rain" monitoring and other park studies, and relates these studies to determinations of pH and what this means in the aquatic system.

2. Acid Rain and Kejimkujik National Park - an Environment Canada publication currently reprinted by the interpretation section of KNP. This publication is still current; despite being 15 years old, the message is valuable.
3. Every year many interpretive programmes cover one or other aspect of air issues. In other words this theme is a component in many programmes.
4. Evening interpretive programmes explain the importance of long term monitoring related to aquatic resources.
5. On guided walks along rivers and during guided canoe paddles, park interpreters cover the message of monitoring and determination of acid rain, mercury, etc. and relate this to water quality and effects on loons, fish and amphibians.
6. Young Canada Works crews contribute directly to Smithsonian biodiversity plots which track the effects of atmospheric pollutants.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Long range transportation of airborne mercury
Value(s) impacted : Loons
Value(s) at risk .. : Water chemistry, soils, aquatic fauna, piscivorus waterfowl, raptors, herptiles, humans, aquatic and terrestrial vegetation.

Issue ..... : Acid deposition
Value(s) impacted : Fish
Value(s) at risk .. : Water chemistry, aquatic fauna, herptiles, soils, aquatic and terrestrial vegetation, cultural resources (petroglyphs).

Issue ..... : Climate change
Value(s) impacted : Biodiversity, species richness
Value(s) at risk .. : Aquatic and terrestrial ecosystems, shoreline erosion, piping plover habitat nesting habitat.

Issue ..... : LRTAP
Value(s) impacted : Loons, fish
Value(s) at risk .. : Ecological integrity of aquatic and terrestrial ecosystems

Issue ..... : UV-B radiation
Value(s) impacted : ???
Value(s) at risk .. : Terrestrial vegetation, aquatic vegetation, water chemistry, aquatic fauna, herptiles, ecosystem climate.

OTHER AIR ISSUES

Issue ..... : Sonic booms from supersonic aircraft in airshed
Value(s) impacted : Undetermined
Value(s) at risk .. : Terrestrial fauna and avifauna

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Inter-continental air traffic
Location of source : Airspace of ecosystem
Frequency ..... : Continuous

Type ..... : Smoke and emissions from the combustion of wood for home heating in communities around and in the ecosystem.
Location of source : Local communities
Frequency ..... : Late Fall to early Spring annually

Type ..... : Emissions from outboard engines in the park and surrounding ecosystem
Location of source : Kejimkujik Lake and Lower Mersey River in the park. All navigable water bodies in the ecosystem.
Frequency ..... : Late Spring till freeze-up annually

AIR ISSUE RELATED VALUES

Value ..... : Salmonids
Air issue(s) ..... : Prevailing continental wind currents carrying acid rain particulate matter converge in the park region affecting reproductive success.

Value ..... : Vegetation
Air issue(s) ..... : Natural structure and form of community associations could be impaired by acid loading (acidic precipitation and fog).

Value ..... : Aquatic avifauna
Air issue(s) ..... : Long range transportation and deposition of mercury

Value ..... : Aquatic primary productivity (diatoms)
Air issue(s) ..... : UV-B radiation

COMMENTS

The park experiences occasional, but increasing in frequency, low-level haze or smog effects on hot and humid days which could have human health implications. This is augmented by open fires at campsites in the evenings.

Due to the convergence of prevailing continental wind currents, this region is a focal point for pollutants from the industrial centres of North America. Acid rain lowers the already poorly buffered water bodies, adversely impacting some aquatic resources and upsetting the natural balance. Terrestrial vegetation may also be effected as essential cations are depleted from soils, in turn favouring some plants and inhibiting others. Mercury is carried by prevailing winds from major producers along the New England seaboard and central America. Some species of fish show elevated levels of mercury, resulting in bioaccumulation in top trophic species such as loons, and presenting a potential hazard to humans who consume fish above recommended levels.

KLUANE

Air issues contact. David Henry, Yukon Field Unit
Persons completing the questionnaire. David Henry and Ray Breneman, Yukon Field Unit

PROGRAMMES

MONITORING

Weather stations

MSC name: .... : Haines Junction, #2100630
PCA name ..... : Haines Junction Parks Canada Operation Centre, #KLWHT
Location ..... : 60.7500, -137.5830; 60°45'00"N, 137°35'00"W; 599.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, barometric pressure
Start date ..... : 1945 (discontinuous records); 1983-05-01 as #2100630
Ownership ..... : MSC
PCA support .... : Logistic support, land and telephone line

PCA name: ..... : Kluane Ecological Monitoring Program Saint Elias Transect
Location ..... : Various locations in and adjacent to the park
Type and duration : Automatic, year-round
Properties recorded: T, P
Start date ..... : 2001-??-??
Ownership ..... : Parks Canada, Arctic Institute of North America
PCA support .... : Majority support; not linked to MSC

PCA name: ..... : Kluane Ecological Monitoring Program Quill
Location ..... : Various locations in and adjacent to the park
Type and duration : Automatic, year-round
Properties recorded: T, P
Start date ..... : 2001-??-??
Ownership ..... : Parks Canada, Arctic Institute of North America
PCA support .... : Majority support; not linked to MSC

PCA name: ..... : Kluane Ecological Monitoring Program Sulphur
Location ..... : Various locations in and adjacent to the park
Type and duration : Automatic, year-round
Properties recorded: T, P
Start date ..... : 2001-??-??
Ownership ..... : Parks Canada, Arctic Institute of North America
PCA support .... : Majority support; not linked to MSC

PCA name: ..... : Kluane Ecological Monitoring Program Silver
Location ..... : Various locations in and adjacent to the park
Type and duration : Automatic, year-round
Properties recorded: T, P

Start date ..... : 2001-??-??
Ownership ..... : Parks Canada, Arctic Institute of North America
PCA support .... : Majority support; not linked to MSC

PCA name: ..... : Kluane Ecological Monitoring Program Donjek
Location ..... : Various locations in and adjacent to the park
Type and duration : Automatic, year-round
Properties recorded: T, P
Start date ..... : 2001-??-??
Ownership ..... : Parks Canada, Arctic Institute of North America
PCA support .... : Majority support; not linked to MSC

Other air monitoring stations or programmes

Name ..... : Snow plot surveys
Location ..... : Four location inside the park
Properties recorded: Depth of snow pack measured three times during late winter and spring; water content of snow measured.
Start date ..... : 1978-??-??
Agency(ies) .... : PCA; Department of Indian and Northern Affairs
PCA support .... : Complete support of surveys in park area

Name ..... : Water quality monitoring
Location ..... : Dezadeash River bridge and other locations
Properties recorded: Water temperature, pH, conductivity, metals
Start date ..... : 1992-??-??
Agency(ies) .... : PCA; Inland Waters, Environment Canada
PCA support .... : Support for field operations

Name ..... : Water quality monitoring
Location ..... : Downstream of Haines Junction Sewage Lagoon
Properties recorded: Coliforms, pH, BOD, metals,
Start date ..... : 1989-??-??, prior to and during effluent release from lagoon affecting areas in and adjacent to the park.
Agency(ies) .... : Village of Haines Junction
PCA support .... : Collaboration on setting standards

RESEARCH

Project ..... : Kaskawulsh Glacier
Location ..... : Kaskawulsh Glacier and Slims River
Purpose ..... : Study recent changes in the Kaskawulsh Glacier's mass wasting rates
Start and end date : 1995-05-?? to 1996-02-??
Agency(ies) .... : University of Alaska, Fairbanks
PCA support .... : None

Project ..... : Collection and analysis of ice and snow
Location ..... : Various glaciers within the park

Purpose ..... : Documentation of organochlorine contaminants in ice layers from 1940 to the present.
Start and end date : 1996-07-?? to 1996-08-??
Agency(ies) .... : Icefield Instruments Inc.
PCA support .... : Logistic support

Project ..... : Ice core from Mt Logan
Location ..... : Mt Logan
Purpose ..... : 10,000-100,000 year temperature profile; profile of greenhouse gases over these time spans.
Start and end date : 1999-2002
Agency(ies) .... : Geological Survey of Canada
PCA support .... : Logistical support

Project ..... : Research on surging glaciers
Location ..... : Trapridge Glacier
Purpose ..... : Determine causes and mechanism of surging glaciers; influence of global warming on surging glaciers.
Start and end date : 1990 ongoing
Agency(ies) .... : Arctic Institute of North America
PCA support .... : None

Project ..... : Treeline dynamics and global warming
Location ..... : Various locations in or adjacent to the park
Purpose ..... : Changes in treeline due to the warming of climate during the past century
Start and end date : 2001-ongoing
Agency(ies) .... : University of Ottawa
PCA support .... : Logistical support

Project ..... : Primary Productivity-AVHRR
Location ..... : Northern Parks
Purpose ..... : Plant productivity, seasonal patterns of growth, length of growing season, landscape fragmentation.
Start and end date : 1998-2001, with a review for another 3 years
Agency(ies) .... : PCA
PCA support .... : Majority of funding

INTERPRETATION AND OUTREACH

1. Information pamphlets distributed at the Visitor Reception Centre
2. Interpretative presentations on and off site and as part of outreach programs. Environmental impacts of global climate change is frequently the focus.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change - direct effects
Value(s) impacted : Permafrost, wildfires frequency and size, rock and mud slides
Value(s) at risk .. : Invasion of exotic species; discharge rates of rivers; increased snow pack, changes in local weather patterns (see comments)

Issue ..... : Climate change - spruce bark beetle infestation
Value(s) impacted : Forest community dynamics, bird populations, forest fire hazards, viewscapes (see comments).
Value(s) at risk .. : Future vegetation communities, forest fire dangers to human infrastructures

OTHER AIR ISSUES

Issue ..... : Cold condensation of airborne contaminants
Value(s) impacted : Aquatic organisms, aquatic ecological processes
Value(s) at risk .. : Aquatic and waterfowl populations

Issue ..... : Surging glaciers
Value(s) impacted : Increase in volumes of meltwater, ice dam lakes
Value(s) at risk .. : Erosion and deposition patterns

Issue ..... : Increase in glacial winds
Value(s) impacted : Change of local wind patterns and sediment supplies
Value(s) at risk .. : Higher particulate loads in atmosphere

Issue ..... : Increase in snow levels
Value(s) impacted : Delay in seasonal plant growth, higher water levels in rivers
Value(s) at risk .. : Delays in summer green-up causing increased stress of animal specially those bearing young. Increased water levels is a public safety concern related to stream crossings and to rafters.

Issue ..... : Climate change - warming, drought, forest insects and diseases
Value(s) impacted : Ongoing spruce bark beetle infestation, loss of mature forest canopy
Value(s) at risk .. : Increased local demand to log the areas adjacent to the park to control forest fire hazards resulting in an increase of environmental stress to large mammals, such as moose and grizzly bear, and their transboundary movements.

Issue ..... : UV-B
Value(s) impacted : Increase in cataracts, skin cancer to wildlife and humans; altered photosynthesis rates in aquatic systems.
Value(s) at risk .. : Human health and wildlife populations

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Smoke and odours from town landfill
Location of source : Landfill 2 km north of town and park boundary
Frequency ..... : 1-2 per week

Type ..... : Smoke and air quality from wildfires
Location of source : Unpredictable locations
Frequency ..... : Less than once per year

Type ..... : Noise and disturbance from aircraft overflights (fixed wings and helicopters)
Location of source : Slims valley, Alsek valley and other locations in the park
Frequency ..... : During the summer, from twice a day to twice a week or less frequently

Type ..... : Recreational and operational use of two stroke engines with associated pollution.
Location of source : Snow machines, boat motors, all terrain vehicles
Frequency ..... : Seasonal variation, varies from less than once/month to daily

Type ..... : Smoke from domestic wood burning for heat
Location of source : Haines Junction, Destruction Bay and Burwash
Frequency ..... : Winter months especially at temperatures <-20° C or during air inversions or periods of ice fogs.

AIR ISSUE RELATED VALUES

Value ..... : Human health concerns
Air issue(s) ..... : Increased heating with wood, air inversions and haze

Value ..... : Visitor aesthetics related to viewscapes
Air issue(s) ..... : Increased heating with wood, air inversions and smoke haze

Value ..... : Incompatible use of snow machines and other physical activities
Air issue(s) ..... : Air quality and lingering gas and oil fumes, human health

Value ..... : Pollution from burning at the landfills
Air issue(s) ..... : Air quality and lingering fumes, human health concerns

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COMMENTS

Air quality in the Kluane region is good to excellent as compared to certain southern locations. Preliminary research focussing on long distance and transboundary movement of air pollutants suggests that these issues are not yet of major concern for the Kluane region.

The multiple impacts of global climate change are a major concern for this park and for this region. Spruce bark beetle (*Dendroctonus rufipennis*) has weakened or killed mature white spruce trees over a 200,000 ha area since 1992, both inside and adjacent to Kluane. The documented and suspected impacts of this large scale infestation have affected vegetation dynamics, forest fire hazards, bird populations and ecosystem processes. It is suspected that this infestation is partially due to global climate change effects. Other possible effects of global warming that we are concerned about include the following: melting of permafrost,

increased flooding, heavier snow fall, changes in glaciers and the local weather patterns generated by glaciers, increased rock and mud slides, increased avalanches, increased frequency and size of forest fires, riparian instability, and damage to roads, town sites and other human infrastructure. The Kluane Ecological Monitoring Programme and other cooperative research projects, in which Parks Canada participates, are documenting some of these possible changes to climate and some of their possible impacts on plant and animal populations and ecosystem processes occurring both in the park and throughout the Kluane region.

KNP is 22,015 km^2 in size and contains diverse mountain topography and vegetation zones. There is a shortage of resources that allow Parks Canada to research and document the microclimate regions and air quality regimes found in this diverse mountainous landscape. Cooperation among regional partners as represented by the Kluane Ecological Monitoring Programme and other research projects is allowing Parks Canada to move forward against these challenges.

KOOTENAY

Air issues contact. Terry Damm, Kootenay/Yoho/Lake Louise National Parks Field Unit
Person(s) completing the questionnaire. Terry Damm

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Kootenay NP KTNY CRSG, #1154400
PCA name ..... : Kootenay Crossing Warden Station
Location ..... : 50.8833 -116.0510; 50°53'00"N, 116°03'04"W; 1170.4 m asl
Type and duration : Manual, year-round
Properties recorded: T, P
Start date ..... : 1965-06-01
Ownership ..... : MSC
PCA support .... : Maintenance, readings

MSC name ..... : Kootenay NP West Gate, #1154410
PCA name ..... : Kootenay West Gate
Location ..... : 50.6303,-116.0620; 50°37'49"N, 116°03'44"W; 899.2 m asl
Type and duration : Manual, year-round
Properties recorded: T, P
Start date ..... : 1968-11-01
Ownership ..... : MSC
PCA support .... : Maintenance, readings

Fire or avalanche control weather stations

PCA name ..... : Kootenay Administration, #KOADM
Location ..... : 50.5833, -116.0833; 50°35'00"N, 116°05' 00"W; 900.0 m asl

Type and duration : Automatic, year-round
Properties recorded: T, P(summer), RH, wind
Start date ..... : 1995, upgraded 2001
Ownership ..... : PCA
PCA support .... : Maintenance

PCA name ..... : McLeod Meadows, #KOMCL
Location ..... : 50.7703, -115.9506; 50°46'13"N, 115°57'02"W; 1158.2 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P(summer), RH, wind, snow depth
Start date ..... : 1997
Ownership ..... : PCA
PCA support .... : Maintenance

PCA name ..... : Swede Creek, #KOLOO
Location ..... : 50.6725, -115.8919; 50°40'21"N, 115°53'31"W; 1402.1 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P(summer), RH, wind, snow depth
Start date ..... : 1997
Ownership ..... : PCA
PCA support .... : Maintenance

PCA name ..... : Vermillion Crossing, #KOVER
Location ..... : 50.9661, -115.9447; 50°57'58"N, 115°56' 41"W; 1249.7 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, wind, snow depth
Start date ..... : 1970s?, automated in 1997
Ownership ..... : PCA
PCA support .... : Maintenance, readings

PCA name ..... : Vermillion (Lower)
Location ..... : 50.9836, -115.9814; 50°59'01"N, 115°58'53.1"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, snow depth, snow temperatures every 20 cm
Start date ..... : 1997
Ownership ..... : PCA
PCA support .... : Maintenance

PCA name ..... : Vermillion (Upper)
Location ..... : 50.9893, -115.9898; 50°59'21"N, 115°59'23"W
Type and duration : Automatic, year-round
Properties recorded: T, P (summer), RH, WS
Start date ..... : 1970s?, automated in 1997
Ownership ..... : PCA
PCA support .... : Maintenance

Snow surveys

Name ..... : BC Hydro station 2c14p
Location ..... : Floe Lake
Type and duration : Automatic, seasonal
Properties recorded : Snow pillow
Start date ..... : 1935
Ownership ..... : British Columbia Hydro
PCA support .... : None

Name ..... : Snow course water quality
Location ..... : Tokkum Creek (10 stations)
Properties recorded : Depth, density, water equivalent
Start date ..... : 1960
Ownership ..... : British Columbia Hydro
PCA support .... : Maintenance, monthly survey

Name ..... : Snow course water quality
Location ..... : Sinclair Creek (10 stations)
Properties recorded : Depth, density, water equivalent
Start date ..... : 1960
Ownership ..... : British Columbia Hydro
PCA support .... : Maintenance, monthly survey

RESEARCH

None

INTERPRETATION AND OUTREACH

None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : The draft park management plan contains mainly motherhood type statements to put air quality on the agenda.
Value(s) impacted : ???
Value(s) at risk .. : Visibility is the only impact specified, related to problems south of the border that, in time, may become our problem.

OTHER AIR ISSUES

Air issue ..... : Smoke from forest fires
Value(s) impacted : ???
Value(s) at risk .. : Asthma/health issues, not just a pretty picture problem, and highway safety

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Smoke - sawdust burner

Location of source : Slocan Mill, Radium
Frequency ..... : Three days per week

Type ..... : Smoke - slash burning/land clearing
Location of source : Columbia Valley
Frequency ..... : Intermittent but usually September through November

Type ..... : Smoke
Location of source : Major campgrounds
Frequency ..... : Seven days per week, May-September

Type ..... : Carbon monoxide from vehicles
Location of source : Redstreak Campground and Sinclair Canyon
Frequency ..... : Visitor season

OTHER AIR ISSUE RELATED VALUES
Value ..... : Simply the pristine nature of mountain air (benchmark value)
Air issue(s) ..... : Any degradation of that lofty and privileged state

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COMMENTS

Generally, the air quality is most affected in KNP during periods of high wildfire activity in surrounding areas. The 1997 fires in Salmon Arm and around Hope, for instance, reduced visibility from the usual 30 km to 5 or 6 km at times. Local sources of air pollution (i.e. sawdust burners) tend to be limited in effect to the Columbia Valley. Our own campgrounds at Redstreak, McLeod Meadows and Marble Canyon also contribute to Summer air ambience ... though nothing compared to what it would have been like before the arrival of the white man, according to our fire people!

The nephelometer project cessation is the biggest change in air quality research for us since our last accounting. That project had a finite life span, and when it ran out there was no money in anyone's budget to continue it. The equipment was removed but conventional weather telemetry instrumentation has been installed to complement an existing fire weather station that has operated there since at least 1995. We still have the sawdust burner on our doorstep in Radium as well, though its use seems to have been curtailed considerably this year and it is scheduled to cease operations altogether in October, pending any further extensions that may be granted. In any event, it has contributed little to our area's main air problem this year, fire smoke!

August 2001 was an unusual month for fires - big fires - in and around us (3,800 ha, 12 km North of Kootenay Crossing). We had the main highway closed for a couple of days because of smoke and were running traffic with pilot cars for a while after that. There is still smoke in the area (25th September 2001). The smoke from that large fire near the Crossing also impacted our neighbours in Banff and Canmore, and Calgary too, for that matter. Lots of complaints; lots of interest and support for the fire programme as well. The official spin was that we were making a new carbon sink so the net result would be better air quality (we were

freeing the carbon from the old sink as well, of course ... an interesting discussion for the academically inclined).

Since 1998 there have been progressive changes to the weather monitoring scene as there is a concerted effort underway to maximize the data logging potential of the fire and avalanche weather stations in this field unit. For the most part, the stations themselves are not new but seasonal use of them by the various park functions (fire and avalanche control) has heretofore meant fragmented records, some periods of non-recording and little co-ordination of the data. This year, one person has been identified to compile this data. The stations do record year-round but the data-loggers just over-write when the data is not collected so much is lost between seasons and, I am told, there is considerable potential for some serious, long-term climate monitoring here. There is also the possibility that MSC has accessed some of our facilities on a more systematic basis as they have the codes required to tap in to our information. Pete Kociuba, MSC, Edmonton, Alberta, would be the best contact.

Lastly, Leopard Frogs used to inhabit Kootenay as well and speculation on the reasons for their decline has included air quality, or air-borne causes, but no data yet exists to support this. (And the fire programme people want it on the record that it is not their fault!)

KOUCHIBOUGUAC

Personne ressource pour les enjeux atmosphériques. Eric Tremblay, Unité de gestion du nord du Nouveau Brunswick
Personne(s) qui remplit(issent) le questionnaire. Eric Tremblay

PROGRAMMES

SURVEILLANCE

Stations météorologiques

Nom SMC	:	Kouchibouguac CS,#8102328
Nom APC	:	Kouchibouguac National Park, SIFP#KGKOU, bâtiment des travaux
Emplacement	:	46.7544, -65.0036; 46°45'16"N, 65°00'13"O; 34.0 m asl
Type et durée	:	Automatisée, toute l'année
Propriétés notées	:	T, P, HR, VV, DV
Date de début	:	1969
Organisme	:	SMC
Type de soutien de APC	:	Entretien et transfert des données

Autres stations ou programmes de surveillance de la qualité de l'air

Programme ou station	:	Polluants à longue portée, bâtiment des travaux
Emplacement	:	46.7544, -65.0036; 46°45'16"N, 65°0'13"W; 34.0 m asl
Propriétés notées	:	Collecteur de précipitation organique
Date de début	:	1991
Organisme(s)	:	Environnement Canada
Type de soutien de APC	:	Entretien, prise et transfert d'échantillons

RECHERCHE

Projet ..... : Les lichens comme indicateurs d'IÉ.
But ..... : Étudier la possibilité d'utiliser les lichens comme indicateur d'IÉ
Date de début et de fin .. : Inconnu; dépendera des fonds
Organisme(s) ..... : Université, RÉSÉ
Type de soutien de APC . : Support financier et logistique.

INTERPRÉTATION ET COMMUNICATIONS EXTÉRIEURES

1. Exposition sur les lichens comme indication de qualité de l'air à quelques reprises chaque été. Mention des problèmes de qualité de l'air et de pollution régulièrement lors de "théâtre en plein air", ex. Polluants à longue portée, pluie acide).

ENJEUX ATMOSPHÉRIQUES ET RESSOURCES CONNEXES

ENJEUX ATMOSPHÉRIQUES TRAITÉS DANS LES DOCUMENTS ACTUELS DE GESTION DES PARCS

Enjeu ..... : Niveau marin
Valeur(s) touchées ..... : Dunes, marais salés, estuaires, changements physiochemiques
Valeur(s) à risque ..... : Perte d'habitats aux niveau des dunes côtières, marais salés. Érosion côtière en augmentation. La colonie de sternes la plus grande au Canada est à risque ainsi que l'habitat du pluvier siffleur. Changement dans les patrons de migration et de fraie des espèces de poisson.

AUTRES ENJEUX ATMOSPHÉRIQUES

Enjeu ..... : Polluants à longue portée et pluies acides.
Valeur(s) touchée ..... : Écosystèmes forestiers et aquatiques et des espèces fragiles d'amphibiens, de lichens et de poissons.
Valeur(s) à risque ..... : Saumon de l'Atlantique, amphibiens

IMPORTANTES SOURCES LOCALES DE POLLUTION

Type ..... : Rejets d'une usine de pâtes et papier
Emplacement de la source : Miramichi
Fréquence ..... : Quelques fois par mois quand le vent est de nord-ouest

Type ..... : Pollution par le diesel des bateaux de pêche commerciale au homard
Emplacement de la source : Aux deux quais de pêches située dans le parc, Cap St- Louis et Loggicroft
Fréquence ..... : Du mois de mai au mois d'octobre

Type ..... : Feux de camps au camping
Emplacement de la source : Camping Kouchibouguac Sud (311) et Côte-à-Fabien (32)
Fréquence ..... : Du mois de juin à septembre

VALEURS AFFECTÉES PAR LA QUALITÉ DE L'AIR

Valeurs ..... : Lichens
Enjeu(x) atmosphérique(s) : Pluies acides et polluants aériens

Valeur ..... : Amphibiens
Enjeu(x) atmosphérique(s) : Pluies acides et polluants aériens.

COMMENTAIRES

Notre qualité de l'air est affectée par une usine de pâtes et papier situé à Miramichi, environ 60 km au nord ouest du parc, lorsque les vents dominants viennent de cette région. Les pluies acides sont présentent dans notre région et affectent les salmonidés et les amphibiens. Le brûlage de bois dans les campings affecte aussi notre qualité de l'air à un niveau local. Des mesures prises dans le camping de Kouchibouguac Sud en 1994 ont démontré que les niveaux acceptables de particules en suspension étaient dépassés à plusieurs reprises dans notre camping lors d'inversion de température.

Des polluants à longue portée ont été mesurés dans les pluies récoltées à Kouchibouguac dans les années 1980 et le suivi de ces contaminants se fait depuis 1991 en collaboration avec l'Environnement Canada à Moncton.

Un autre aspect préoccupant du changement climatique est la remontée du niveau marin. À Kouchibouguac cela pourrait se concrétiser par une perte d'habitat au niveau des dunes, des estuaires et des marais salés, tout en accélérant l'érosion en bordure des tourbières côtières.

LA MAURICIE

Personne ressource pour les enjeux atmosphériques. Albert van Dijk, Unité de gestion La Mauricie
Personne qui remplit le questionnaire. Albert van Dijk

PROGRAMMES

SURVEILLANCE

Stations météorologiques

Nom APC ..... : La Mauricie
Emplacement ..... : 46.7678, -73.0064; 46°46'04"N, 73°00'23"O; 390.0 m asl
Type et durée ..... : Semi-automatisée, annuel
Propriétés notées ..... : T, P, HR, VV, DV
Date de début ..... : 1999
Organisme ..... : SMC, RÉSÉ
Type de soutien de APC . : Entretien, récupération des données, data-logger ainsi que transmission vers les banques de données nationaux.

Depuis janvier 2001, non-opérationnel à cause des problèmes d'approvisionnement en énergie.

Feu

Nom APC ..... : La Mauricie Park, SIFP#LMPLU
Emplacement ..... : 46.7372, -73.0500; 46°44'12"N, 73°02'36"O; 240.0 m asl
Type et durée ..... : Automatisée, mi-avril à fin octobre
Propriétés notées ..... : T, P, HR, VV, DV
Date de début ..... : 1993
Organisme ..... : APC
Type de soutien de APC . : Tous

Autres stations ou programmes de surveillance de la qualité de l'air

Programme ou station .. : Mise à jour des banques portant sur la qualité des eaux
Emplacement ..... : Lac Éclair et lac Francina (NAQUAT#QU02NF0003 et QU02NF0030).
Propriétés notées ..... : Alcalinité, SO4, Cl, NOx, pH, Ca, Mg, Na, K, COD, CID, Al, Ba, Be, Cd, Co, Cr, Cu, Fe, Il, Mn, Mo, Ni, Pb, Sr, V, Zn, couleur, conductivité.
Date de début ..... : 1982
Organisme(s) ..... : Environnement Canada, réseau TADPA-Québec
Type de soutien de APC . : Équipement et main-d'oeuvre occasionnellement

RECHERCHE

Projet ..... : Contamination au mercure de la faune piscivore
But ..... : Compréhension des effets de métaux lourds dans la faune et réduction éventuelle de ces derniers; mésurer le contenu mercure dans sang, plumes et oeufs du Plongeon huard.
Date de début et de fin .. : 1997-1999, 2001-2004(?)
Organisme(s) ..... : Service canadien de la faune
Type de soutien de APC . : Équipement et main d'oeuvre lors de la capture ainsi que pré-localisation des couvées.

Projet ..... : Effets des dépôts acides sur la faune aquatique
But ..... : Compréhension des effets de pollution atmosphérique sur la diversité biologique et les habitats.
Date de début et de fin .. : 2001-07 - inconnu
Organisme(s) ..... : Service canadien de la faune
Type de soutien de APC . : Équipement et main d'oeuvre lorsque nécessaire pour se rendre aux lacs ou pour la prise d'échantillons/observations.

INTERPRÉTATION ET COMMUNICATIONS EXTÉRIEURES

1. 1999: causerie du Service d'interprétation sur les bassins versants avec un élément touchant la pollution de l'eau.
2. 2001: causerie "Verse-eau" sur le cycle de l'eau, où la pollution aéroportée a été mentionnée
3. 2001: dans le cadre des ateliers de formation sur l'intégrité écologique des parcs nationaux à l'intention des employés, nous avons fait systématiquement fait référence à la

problématique du transport à distance de polluants et leur impact sur les écosystèmes du parc.

ENJEUX ATMOSPHÉRIQUES ET RESSOURCES CONNEXES

ENJEUX ATMOSPHÉRIQUES TRAITÉS DANS LES DOCUMENTS ACTUELS DE GESTION DES PARCS

Enjeu ..... : Changements climatiques globaux.
Valeur(s) touchées ..... : On a pu constater la disparition de populations locales de poissons, des baisses de niveaux d'abondance de certaines populations, l'absence de reproduction et l'impossibilité pour les géniteurs d'accéder à des sites historiques de reproduction en ruisseau. Fluctuations importantes des niveaux d'eau (crus soudains plus fréquents depuis 1990) ont un impact négatif sur le succès de la nidification du Plongeon huard.
Valeur(s) à risque ..... : Les cycles de nutriments, la production primaire et la diversité biologique devraient être affectés; populations isolées de poissons (truite mouchetée, omble chevalier); végétation forestière dépendant du feu (forêts de pin blanc notamment); amphibiens.

Enjeu ..... : Retombées acides
Valeur(s) touchées ..... : 29 % des plans d'eau du PNLM sont acidifiés et 17 % sont en voie de l'être; impacts notables sur les chaînes trophiques et les populations de truite mouchetée; dépérissement des arbres feuillus, notamment l'érable à sucre (réduit la capacité des arbres de se défendre contre des agents pathogènes); diminution de la population reproductrice du Plongeon huard peut-être liée à ce phénomène.
Valeurs à risque ..... : L'ensemble des écosystèmes aquatiques du parc.

Enjeu ..... : Amincissement de la couche d'O_3 et intensification des rayon UV-B
Valeur(s) touchée(s) .... : Inconnu
Valeur(s) à risque ..... : Inconnu

AUTRES ENJEUX ATMOSPHÉRIQUES

Enjeu ..... : Métaux lourds: présence élevée de cadmium dans les abats d'ongulés; intoxication par les plombs de pêche et par des plombs de chasse chez les canards barbotteurs lors de migrations; mercure, plomb, zinc et de cadmium d'origine atmosphérique est probable; accumulation probable ou démontrée dans les chaînes alimentaires; situation réelle inconnue.
Valeur(s) touchée(s) .... : Huard à collier

Valeur(s) à risque ..... : Grands mammifères; espèces au sommet des chaînes alimentaires

IMPORTANTES SOURCES LOCALES DE POLLUTION

Type ..... : Fonderie d'aluminium
Emplacement de la source : À 15-25 km des limites du parc
Fréquence ..... : Lors de vents du sud-ouest ou du sud, surtout au printemps et en automne.

Type ..... : Usines de pâtes et papier
Emplacement de la source : À 15-25 km des limites du parc
Fréquence ..... : Lors de vents du sud-ouest ou du sud, surtout au printemps et en automne.

VALEURS AFFECTÉES PAR LA QUALITÉ DE L'AIR

Valeur ..... : Forêts de pin blanc (*Pinus strobus*)
Enjeu(x) atmosphérique(s) : Changement climatique, diminution de la fréquence des feux naturels.

Valeur ..... : Omble de fontaine (*Salvelinus fontinalis*)
Enjeu(x) atmosphérique(s) : Changement climatique, diminution des précipitations estivales.

Valeur ..... : Forêts de conifères associés à la forêt boréale
Enjeu(x) atmosphérique(s): Changements de température favoriseront leur disparition en faveur des espèces de feuillues associées à des zones méridionales.

Valeur ..... : Oiseaux piscivores (Plongeon huard, Bec-scie, grand héron etc.).
Enjeu(x) atmosphérique(s) : Acidification de lacs avec perte de productivité

Valeur ..... : Érables à sucre
Enjeu(x) atmosphérique(s) : Acidification du sol des forêts induisant un stress qui rend les arbres moins résistants aux agents pathogènes.

COMMENTAIRES

Hormis les conséquences des précipitations acides ou de métaux lourds sur les lacs et leurs composantes biologiques et les effets possibles sur l'état de santé des forêts, peu d'effets d'une piètre qualité d'air sont actuellement mesurables sur le territoire du parc. En effet, cette problématique est plutôt diffuse en absence de données directes sur la qualité des masses d'air qui peuvent affecter les écosystèmes du parc. Des suivis sont prévus dans les différents documents de gestion du parc, notamment des paramètres permettant de suivre la

qualité des eaux de nos lacs et rivières. Nous avons besoin de données sur la présence de polluants dans l'air. Pour l'instant nous ne prévoyons aucun programme d'échantillonnage in situ. Un inventaire des stations appartenant à d'autres organismes et qui pourraient fournir une image pertinente de la qualité de l'air dans la région s'impose en premier lieu.

MINGAN (Archipel-de-Mingan)

Personne ressource pour les enjeux atmosphériques. Stéphane Marchand, Unité de gestion Mingan
Personne qui remplit le questionnaire. Stéphane Marchand

PROGRAMMES

SURVEILLANCE

Stations météorologiques
Aucune

Autres stations ou programmes de surveillance de la qualité de l'air
Aucune

RECHERCHE

Aucune

INTERPRÉTATION ET COMMUNICATIONS EXTÉRIEURES

Rien

ENJEUX ATMOSPHÉRIQUES ET RESSOURCES CONNEXES

ENJEUX ATMOSPHÉRIQUES TRAITÉS DANS LES DOCUMENTS ACTUELS DE GESTION DES PARCS

Aucun enjeu atmosphérique identifié

AUTRES ENJEUX ATMOSPHÉRIQUES

Aucun

IMPORTANTES SOURCES LOCALES DE POLLUTION

Aucune

RESSOURCES AFFECTÉES PAR LA QUALITÉ DE L'AIR

Aucune

COMMENTAIRES

Aucune étude n'a touché ou mentionné des préoccupations concernant la qualité de l'air depuis la création de la Réserve de parc national de l'Archipel-de-Mingan. Il est possible que certaines valeurs du parc soient liées aux enjeux atmosphériques (par exemple, certaines espèces d'amphibiens), mais le parc ne dispose pas des données nécessaires pour identifier

ces valeurs. De plus, le parc est éloigné de la zone d'influence des grands vents originant des zones industrielles nord-américaines. Quelques stations de mesure de la qualité de l'air sont localisées à proximité du parc et il serait possible d'avoir accès facilement aux données qui y sont recueillies.

MOUNT REVELSTOKE NATIONAL PARK

Air issues contact. Bill Browne, Mount Revelstoke/Glacier National Parks Field Unit
Person(s) completing the questionnaire. Bill Browne, with inputs from John Kelly

PROGRAMMES

MONITORING

Weather stations

Fire control

PCA name ..... : Revelstoke One Mile, #MRYRV or #REMO1???
Location ..... : 51.0235, -118.2055; 51°01'25", 118°12'20"W; 554.0 m asl
Type and duration : Automatic, summer
Properties recorded : T, P, RH, WS, WD
Start date ..... : ???
Ownership ..... : MSC, PCA
PCA support .... : ???

Water supply - BC Hydro

PCA name ..... : Balsam Lake
Location ..... : ???
Type and duration : Automatic, year-round
Properties recorded : T, P, RH
Start date ..... : ???
Ownership ..... : British Columbia Hydro
PCA support .... : None

Other air monitoring stations or programmes

None

RESEARCH

Project ..... : Contaminants in fish in high elevation lakes
Purpose ..... : Document LRTAP; determine contaminant levels in fish and potential impact of consumption by people and raptors.
Start and end dates : June 1999 to 2001
Agency(ies) .... : Environment Canada, PCA
PCA support .... : Staff time and money to collect and shop fish samples

Total DDT levels in upper Jade Lake Fish were among the highest sampled, higher than lowland areas near Veracruz in Mexico where DDT is still used. Lower but still significant levels were found in Eva and Millar Lake fish (smaller catchment area, very slow-growing

fish). Contamination is likely resulting from cold-condensation of these volatile organochlorines at altitude and transfer into the lakes. Total DDT in the total carcass composites was about 225 ng/g, about 16 times the guideline level of 14 ng/g to protect wildlife consumers. Toxaphene data is not available yet but is expected to be similarly high and well in excess of guidelines.

INTERPRETATION AND OUTREACH

None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

None

OTHER AIR ISSUES

Issue ..... : Climate change
Values at risk ... : Unclear, but more variable weather patterns via climate change could result in more frequent fires. Warming climate could stress trees, leading to more disease, more fuels and greater likelihood of loss of old-growth and old-growth dependent species such as mountain caribou, red-listed, and already at risk from forestry and recreation (mostly snowmobiling).

Issue ..... : LRTAP (DDT/DDE, toxaphene)
Values at risk ... : Human health, fish and avian predators (osprey) especially in high elevation lakes.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : PM 10 from beehive burners, lumber mill
Location of source : Revelstoke and Downie beehive burners, Golden pulp mill
Frequency ..... : Ongoing, although worse in Winter

Type ..... : Through traffic
Location of source : Golden railway yards, railway and highway through the park
Frequency ..... : Ongoing, although worse in Winter

Type ..... : PM 10 from domestic wood stoves and furnaces
Location of source : Golden and Revelstoke
Frequency ..... : Ongoing, although worse in Winter

Type ..... : PM 10, dust and smoke from biomass burning
Location of source : Regional
Frequency ..... : Spring and Fall

Type ..... : Dust from reservoir drawdown
Location of source : Reservoir

Frequency ..... : Spring and Fall

Together the above sources result in high PM 10 levels that frequently exceed human health objectives for "poor" in Golden, particularly during the Fall to Spring period (based on continuous monitoring), and occasionally in Revelstoke (based on intermittent monitoring: 24 hours every 6 days).

If funding is obtained to install a continuous sampler (Tapered Element Oscillating Microbalance) in Revelstoke, sufficient data will become available to issue health advisories and develop an airshed management plan for the Revelstoke area. The Mount Revelstoke and Glacier National Parks field unit is offering $1,500 of the $10,000 operational costs and will become partners with the British Columbia Ministry of Environment, Lands and Parks if the remainder of the funds is provided by other potential partners (i.e. City of Revelstoke).

AIR ISSUE RELATED VALUES

Value ..... : Old-growth forests and species
Air issue ..... : Climate change

Value ..... : Human health, visibility, aesthetics
Air issue ..... : Fine particulate pollution from local sources in Revelstoke and Golden

Value ..... : Contaminants in fish and avian consumers
Air issue ..... : LRTAP

COMMENTS

Air quality within MRGNP is not significantly affected by local sources of air pollution (including beehive burners, wood smoke from stoves, diesel fuel from trucks and rail cars, prescribed burning etc.). Local air pollution sources are causing elevated PM 10 levels in adjacent communities of Golden and Revelstoke which are of concern in terms of human health. Climate change with the resultant potential for an increased drought, fuel build-up, and increased catastrophic fire, is a major issue in terms of old-growth forest loss and the potential extirpation of species such as red-listed mountain caribou. LRTAP such as pesticides is affecting containment levels in fish populations in high elevation lakes.

NAHANNI

Air issues contact. Douglas Tate, Nahanni National Park Reserve
Person(s) completing the questionnaire. Douglas Tate, with updates from Barry Troke

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Deadmen Valley, #22010H0
PCA name ..... : Deadmen Valley

Location ..... : 61.2500, -124.4667; 61°15'00"N, 124°28' 00"W; 283.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, solar radiation, snow depth
Start date ..... : 2001-07-25
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, provision of access (cost & logistics) and staff assistance for installation and periodic service.

MSC name ..... : Rabbit Kettle, #2203342
PCA name ..... : Rabbitkettle Lake, #WQF
Location ..... : 61.9631, -127.2090; 61°57'47"N, 127°12'33"W; 618.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, solar radiation, snow depth
Start date ..... : 1995-09-15
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, provision of access (cost & logistics) and staff assistance for installation and periodic service.

This station has encountered loss of data, equipment damage from animal disturbance, primarily bears.

MSC name ..... : Virginia Falls, #2203943
PCA name ..... : Virginia Falls
Location ..... : 61.6167, -125.7833; 61°37'00"N, 125°47' 00"W; 609.6 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH; WD and WS are non-functional
Start date ..... : 1973-08-01
Ownership ..... : MSC
PCA support .... : None

There is minimal weather equipment placed at water survey gauge on South Nahanni River; station has experienced equipment damage, and does not receive regular maintenance.

MSC name ..... : Yohin, #2204300
PCA name ..... : Yohin
Location ..... : 61.2333, -123.7333; 61°14' 00"N, 123°44' 00"W; 204.0 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, solar radiation, snow depth
Start date ..... : 2001-07-27
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, provision of access (cost & logistics) and staff assistance for installation and periodic service.

This new station has already experienced equipment damage from animal disturbance (bears).

Notes: all stations are designed to transmit data daily to satellite, and we receive automatic daily messages from the MSC system to a Parks email account. This permits daily calculation of the fire weather index for Rabbitkettle.

About the bears, we did install a 7' chainlink fence around the Rabbitkettle one, and a grizzly still managed to get in, pull off some wiring, break the thermometer, and open up the battery box. It did not really eat much though. We are curious how it got over the fence and yet left so little trace (no bent support poles or warped fencing to show where it entered, plus only one hair found to indicate it was a grizzly). There are no solvents on site (I think), although glycerol has been an attractant at the Environment Canada site at Virginia Falls, and petroleum products are a possible attractant to a bear which has taken great interest in the Rabbitkettle cabin and tool shed a few times. This individual could quite likely be the Rabbitkettle Lake weather station culprit too.

We now have bear boards (plywood with nails) surrounding the site. At the new stations, Yohin now has a fence around it, and the Deadmen Valley station will next year. I'm a bit worried about what may happen to the this station in early Spring when the grizzlies awake and roam around before we get it protected.

Other air monitoring stations or programmes

Name ..... : Paleolimnology and lake sediment toxicology
Location ..... : 61.6167, -125.7833; 61°37'00"N, 125°47'00"W
Properties recorded: T, P
Start date ..... : 1999
Agency(ies) .... : Parks Canada , MSC
PCA support .... : All access, sampling and lab analysis costs, logistics, staff assistance in field.

This is part of larger program incorporating sites at Tuktut Nogait, Aulavik and Qutinnirpaaq national parks. It is also part of NNPR water quality programme, but relates to climate history and change, as well as air-borne pollutants which may be deposited in lake sediments.

Name ..... : Flowering plant phenology
Location ..... : Rabbitkettle Lake
Properties recorded: Phenology of trembling aspen, snowmelt, ice-out; assessing potential biological effects of climate change
Start date ..... : 1994
Agency(ies) .... : PCA; EMAN-North
PCA support .... : All

Name ..... : AVHRR monitoring of northern parks
Location ..... : Several points in different vegetation types
Properties recorded: Primary productivity measured through NDVI; assessing change in productivity over space, habitats and time. Not air quality *per se*, but relates to climate change.
Start date ..... : 1999
Agency(ies) .... : PCA, northern parks and Western Canada Service Centre
PCA support .... : All

RESEARCH

None

INTERPRETATION AND OUTREACH

1. No publications or interpretive programs specifically on air quality issues.
2. Interpretation and public safety messages do provide information on fire, and special efforts are carried out when forest fire smoke may affect visitor health and safety.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : ???
Value(s) at risk .. : Permafrost, fire return intervals, fire intensity and effects

Issue ..... : Mines in region as potential air pollution source
Value(s) impacted : ???
Value(s) at risk .. : Air quality downwind of mine sites, aquatic quality (from fallout), possibly sensitive lichen and bryophyte species.

Issue ..... : Oil and gas exploration and development in region as a potential air pollution source
Value(s) impacted : ???
Value(s) at risk .. : Air quality downwind of development sites, aquatic quality (fallout), possibly sensitive lichen and bryophyte species.

OTHER AIR ISSUES

Issue ..... : Forest fires
Value(s) impacted : ???
Value(s) at risk .. : Unknown. Air quality is, however, affected by forest fires, and Nahanni National Park Reserve does have an active, natural fire regime over the majority of its area. When fires are burning in the park air quality may be detrimental to tourism, as it could cause breathing problems for people who are sensitive to smoke. We did have a significant fire in the park this year, about 75 km^2, but it did not present any health or public safety risks, and did not require any closures. Scott and Suffling (2000) suggested that this region could experience a doubling of forest fire frequency and increased intensity under models of global warming and increased CO_2.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : CanTung Mine
Location of source : 45 km west of park border
Frequency ..... : Mine facilities and town site in place at previously operated Tungsten mine. Company has publicly announced its intention to resume operations in December 2001.

Type ..... : Oil and gas development
Location of source : 75 km southeast of park border

Frequency ..... : Advanced exploration occurring at several sites, and at least one natural gas well in high production northeast of Fort Liard. The area is estimated to be one of the largest known natural gas reserves in Canada.

AIR ISSUE RELATED VALUES
None

COMMENTS

At this time it is presumed that Nahanni National Park Reserve enjoys high air quality, although this has not been accurately assessed. Water quality research and monitoring has been a park priority, however, and sediment sampling from rivers and lakes has not indicated significant deposition of airborne pollutants.

The park reserve does not currently monitor air quality nor has it identified any major air quality issues, other than potential sources. The current draft management plan does state that a key action for the park reserve is to "Assess air quality issues and determine actions."

The major problem encountered with the use of automated weather/climate monitoring stations in Nahanni National Park Reserve is equipment damage from animal disturbance, primarily bears, as indicated in the previous section on weather stations. The remoteness of the stations presents significant logistic and financial considerations in terms of maintenance as well.

There is a proposed Prairie Creek zinc mine 15 km north of park border. The infrastructure is already on the site. The mine is not currently operational but the company has applied for permits for advanced exploration and to operate a test plant.

PACIFIC RIM

Air issues contact. Bob Redhead, Coastal British Columbia Field Unit
Person(s) completing the questionnaire. Bob Redhead

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Cape Beale Light, #1031316
PCA name ..... : Cape Beale Light
Location ..... : 48.7833, -125.2170; 48°47'00"N, 125°13'00"W; 25.9 m asl
Type and duration : ???, year-round
Properties recorded: T, P, RH, WS, WD, pressure
Start date ..... : 1968-02-01
Ownership ..... : Coast Guard???
PCA support .... : None

MSC name ..... : Carmanah Point, #1031402
PCA name ..... : Carmanah Point
Location ..... : 48.6117, -124.7510; 48°36'42"N, 124°45'05"W; 38.1 m asl
Type and duration : ???, ???
Properties recorded: T, P
Start date ..... : 1968-03-01
Ownership ..... : Coast Guard???
PCA support .... : None

MSC name ..... : Nitinat Lake (AUT), #103EFJ0
PCA name ..... : Nitinat Lake
Location ..... : 48.6667, -124.8330; 48°40'00"N, -124°50'00"W; 36.4 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, pressure
Start date ..... : 1987-06-11
Ownership ..... : ???
PCA support .... : None

MSC name ..... : Pachena Point, #1035940
PCA name ..... : Pachena Point
Location ..... : 48.7167, -125.1000; 48°43'00"N, 125°06'00"W; 37.0 m asl
Type and duration : ???
Properties recorded: T, P
Start date ..... : 1924-11-01
Ownership ..... : Coast Guard???
PCA support .... : None

MSC name ..... : Tofino A, #1038205
PCA name ..... : Tofino Airport (or Tofino ???), #PRYAZ
Location ..... : 49.0806, -125.7780; 49°04'50"N, -125°46'40"; 24.1 m asl
Type and duration : Manual???, winter, irregular
Properties recorded: T, P, RH, WS, WD, pressure
Start date ..... : 1942-07-01
Ownership ..... : NavCan
PCA support .... : None

Other air monitoring stations or programmes
None

RESEARCH
None

INTERPRETATION AND OUTREACH
The park, in conjunction with MSC, operates a small weather station that provides sea state conditions, UV index and local weather.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Camp fires in our campground
Value(s) impacted : Unknown
Value(s) at risk .. : Personal health of campers and campground staff. The Park may work toward a partial ban campfires.

OTHER AIR ISSUES

Issue ..... : Climate change
Value(s) impacted : Unknown
Value(s) at risk .. : Fire regimes, insect infestations, etc.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Airborne particulate and moisture from nearby asphalt plant
Location of source : Near eastern boundary of the Long Beach Unit
Frequency ..... : Summer operation

Type ..... : Heavy metal release and noxious substance production by increasing vehicle and vessel traffic.
Location ..... : Long beach Unit, Broken Group Islands, Ucluelet and Tofino harbours
Frequency ..... : Increasing during summer. The Park could consider subsidizing or supporting some form of public transport to and from the local communities. This is being tried by a private firm but the Park has not promoted this form of transport even in general terms.

Type ..... : Airborne particulate and other emissions from local fish plants
Location ..... : Villages of Tofino and Ucluelet
Frequency ..... : Constant operation during Summer and Autumn

Type ..... : CO_2 and air borne particulate from combustion
Location ..... : Areas around Park, slash burning
Frequency ..... : Autumn

AIR ISSUE RELATED VALUES

None

COMMENTS

The Park is making efforts to comply with the standards outlined in the Environmental Management System. Pacific Rim purchases the most fuel efficient small engines possible thus reducing emissions. Pacific Rim has purchased a battery operated cart for use in the Green Point Campground. The Park uses a wind generator and solar panels to power in the cabin in the Broken Group Islands.

There are increasing concerns over the continued cutting of forests in the area. There are a number of issues including local climate changes and decrease of stream shade which will elevate stream temperatures. The impact of climate change on the intertidal zone is a matter of speculation. There could be serious consequences aside from the raising of the sea level. Salmon are very temperature sensitive in both the marine and fresh water environments. Any warming of their marine or freshwater habitats could be critical as many populations are already severely stressed. The temperate rain forests of the west coast are strongly influenced by precipitation levels, the impact of reduced precipitation on these forests is unknown.

Concern has been expressed about air pollution arising from China. Based on the deposition of dust on northern North America from the large dust storms in central China earlier this year there is the possibility that other particulate are settling here as well. China is the largest user of coal for industrial purposes in the world. The noxious substances from this combustion could be being deposited in North America.

Should funding become available, Pacific Rim would be able to monitor a number of atmospheric indicators. A considerable amount of baseline data already exists including sea surface temperature dating back 80 years, precipitation and air temperatures for nearly the same length of time. Excellent opportunities exist for partnering with various agencies (e.g. through the Long Beach Model Forest) and departments such as Environment Canada, the Canadian Coast Guard and others.

POINT PELEE

Air issues contact. Tom Linke, Southwest Ontario Field Unit
Person(s) completing the questionnaire. Gary Mouland, now at Gros Morne

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Point Pelee CS, #613P001
PCA name ..... : Point Pelee (PPNP)
Location ..... : 41.9487, -82.5191; 41°56'55"N, 82°31'08"W; 176.8 m asl
Type and duration : Automatic, year-round, CR10X
Properties recorded: T, P, RH, WS, WD, snow depth
Start date ..... : 1966; moved to nearby location 2001-05-31
Ownership ..... : PCA
PCA support .... : Partnership with MSC

Other air monitoring stations or programmes

Name ..... : Inorganic and organic precipitation samplers
Location ..... : In park, west of the pump house
Properties recorded: Contaminants
Start date ..... : 1995
Agency(ies) .... : MSC

PCA support .... : Sample collection, routine maintenance

RESEARCH
None

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS
None

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
Type ..... : Pesticides
Location of source : Farm fields immediately north of park
Frequency ..... : ???

Type ..... : Petrochemical emissions
Location of source : Sarnia, 4 oil flares north of park
Frequency ..... : Daily

AIR ISSUE RELATED VALUES
Value ..... : Herptiles
Air issue(s) ..... : Organochlorines

COMMENTS
Point Pelee is located in an area that is affected by the high levels of industrial and agricultural activities, and is part of a region that gets smog alerts. The long thick bronze haze just above the horizon can often be used as a good indicator. The Park as yet has not developed any long term air quality monitoring programme directed at any specific pollutants, although general programmes have been recommended.

PRINCE ALBERT
Air issues contact. Norman Stolle, Northern Prairies Field Unit
Person(s) completing the questionnaire. Fiona Moreland

PROGRAMMES
MONITORING
Weather stations

PCA name ..... : Cookson; #PACOK
Location ..... : 53.6667, -106.5000; 53°40'00"N, 106°30'00"W; 525.8 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, barometric pressure
Start date ..... : 1989 (prior to automated station, observer recorded data as early as 1934)
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, secure instrument area, power and communication lines, tower purchase, landscape and maintenance of area to MSC specifications, assistance with instrument installation, and completing snow surveys.

MSC name ..... : Waskesiu Lake, #4068559
PCA name ..... : Bear Trap/Waskesiu, #PAWLV
Location ..... : 53.9167, -106.0806; 53°55'00"N, 106°04'50"W; 569.4 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, pressure
Start date ..... : 1934; automated/on-line 1989-12-21
Ownership ..... : MSC
PCA support .... : Equipment purchase, secure instrument area, power and communication lines, tower purchase, landscape and maintenance of area to MSC specifications, assistance with instrument installation, and completing snow surveys.

Fire weather
MSC name ..... : Big River, #4060620
PCA name ..... : Brvr, #PABRV
Location ..... : 53.8331, -107.0306; 53°49'59"N, 107°01'50"W; 502.9 m asl; west of PA
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD, fire weather information
Start date ..... : 1956-10-01
Ownership ..... : PCA, Saskatchewan Environment and Resource Management
PCA support .... : Maintenance, upgrades, purchase of data loggers, sensors, modems, power and communication lines.

PCA name ..... : Candle Lake, #PACAN???
Location ..... : 53.7583, -105.2167; 53°45'30"N, 105°13'00"W; east of PA
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD, fire weather information
Start date ..... : 1989/90
Ownership ..... : Saskatchewan Environment and Resource Management
PCA support .... : Maintenance, upgrades, purchase of data loggers, sensors, modems, power and communication lines.

PCA name ..... : Delworth/Thunder Mountain, #PA2/PA3

Location ..... : 55.0000, -106.0000; 55°00'00"N, 106°00'00"W; 449.9 m asl
Type and duration : ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : ???

PCA name ..... : Elaine Lake
Location ..... : 53.0000, -106.0833; 53°00'00"N, 106°05'00"W; south of PA
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD, fire weather information
Start date ..... : 1989/90
Ownership ..... : Saskatchewan Environment and Resource Management
PCA support .... : Maintenance, upgrades, purchase of data loggers, sensors, modems, power and communication lines.

PCA name ..... : Molonosa, #PA1 or #PAMOL???
Location ..... : 54.4476, -105.5217; 54°26'51"N, 105°31'18"W; 499.9 m asl; east of PA
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD, fire weather information
Start date ..... : 1989/90
Ownership ..... : PCA, Saskatchewan Environment and Resource Management
PCA support .... : Maintenance, upgrades, purchase of data loggers, sensors, modems, power and communication lines.

PCA name ..... : Rabbit Hill, #PARAB
Location ..... : 54.3297, -107.1806; 54°19'47"N, 107°10'50"W; 579.1 m asl; NW of PA
Type and duration : Automatic, seasonal
Properties recorded: T, P, RH, WS, WD, fire weather information
Start date ..... : 1989/90
Ownership ..... : PCA, Saskatchewan Environment and Resource Management
PCA support .... : Maintenance, upgrades, purchase of data loggers, sensors, modems, power and communication lines.

PCA name ..... : Wabno, #PAWAB
Location ..... : 54.3738, -106.3665; 54°22'26"N, 106°21'59"W; 571.5 m asl
Type and duration : ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : ???

PCA name ..... : Wask, #PAWAS
Location ..... : 54.8816, -106.1290; 54°52'54"N, 106°07'44"W; 533.4 m asl

Type and duration : ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : ???

Other air monitoring stations

Name ..... : Boreal Ecosystem Research and Monitoring Sites (BERMS)
Location ..... : 53.6291, -106.1958; 53°37'45"N, 106°11'45"W
Properties recorded: To supplement the spatially rich BOREAS data sets of 1994 and 1996 with a longer term multi-year perspective. Objectives: 1) to characterize the seasonal and interannual variability in the boreal forest's carbon and water budgets, by measuring the fluxes of CO_2, water vapour and energy over several complete annual cycles; 2) to understand the climatic and hydrologic controls on carbon sequestration by boreal forests; 3) to improve the parameterizations of the boreal forest in Canadian climate and forest ecosystem carbon budget models; and 4) to represent Canadian boreal forests in the global CO_2 flux research network. These objectives will provide fundamental information on the role of the boreal forest in global change. They will increase our ability to predict not only how forested ecosystems will respond to climatic variability and change, but also how feedbacks from boreal forests to the atmosphere will influence the rate and magnitude of climate change.
Start date ..... : 1997-1999, possible extension to 2001
Agency(ies) .... : MSC, CFS, PCA, University of British Columbia ; for sites outside PANP - University of Wisconsin, Queens University, NASA and Harvard University).
PCA support .... : Provision of an Environmental Site Manager for entire Southern Study Area, to do regular site security checks, maintain equipment, collect data, contribute towards the operating budget for the Site Management position, and provide a secure instrument area.

RESEARCH

Project ..... : BOREAS
Purpose ..... : To improve our understanding of the interactions between the boreal forest biome and the atmosphere in order to clarify their roles in global change.
Start and end dates : 1993 - 1996
Agency(ies) .... : NASA, MSC, CCRS, CFS, Canadian and American Universities
PCA support .... : Secure instrument area, provision of site management, site security checks, maintenance of equipment, data collection, financial and in-kind contributions.

Project ..... : Ambient measurements of non-methane hydrocarbons (BOREAS)

Purpose ..... : To determine seasonal trends and local influences of non-methane hydrocarbon concentrations in the boreal forest.
Start and end dates : 1994-1997
Agency(ies) .... : York University
PCA support .... : Processing of research permit application and identifying a field assistant to collect the data.

Project ..... : Transport of agricultural pesticides into the boreal ecosystem (BOREAS)
Purpose ..... : To measure long range atmospheric transport of agricultural pesticides
Start and end dates : 1993-1996
Agency(ies) .... : MSC, National Hydrology Research Institute and PCA
PCA support .... : Field support, maintenance of wet and dry deposition samplers, secure site

INTERPRETATION AND OUTREACH

1. BOREAS interactive multimedia CD-ROM "Learning How the Great Northern Forest and Global Climate Interact," 1994, PCA
2. BOREAS photo CD images, 1995, PCA
3. BOREAS - Discovering the Northern Ecosystems, 1995, NRC
4. BOREAS information pamphlet, 1994, Minister of Supply and Services - BOREAS Secretariat, CCRS, NRC; BOREAS Project Office NASA, Goddard Space Flight Centre
5. In 1994, there were numerous events such as; hikes, interpretive programs and science night presentations which were developed as a result of BOREAS. Since then there has been a "Science Night" every year, where scientists who are involved in research projects in the Park, are asked to make presentations to the public.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Described in the Terrestrial Ecosystem Management Framework (TEMF) - 3.3 Global Warming - Result Statement: "PANP demonstrates leadership by monitoring and reducing the volume of greenhouse gases emitted as a consequence of park operations. PANP accommodates research about the effects of climatic change upon regional ecosystems and the boreal forest biome. PANP inspires Canadians to reduce the impact of climate change on global ecosystems."

Value(s) at risk .. : From the Barriers and Risks section: "Even if the majority of scientists turned out to be wrong, and emission reductions were not necessary to prevent undesirable climate change, the conservation of non-renewable fossil fuel resources, the extension of landfill life cycles and the reduction of emissions which cause acid rain are sufficient reasons to take action. National parks should focus on conserving existing forest ecosystems. The number of protected areas, their size, the heterogeneity within and connectivity between protected areas, and the

genetic, species and landscape diversity of all forest will be important to the survival of biodiversity during a period of climatic change. Included in this document are the associated items such as; actions, short-term management initiatives, rationale, opportunities, scope, and linkages" (TEMF, 1994, p.21-24).

Air issue ..... : Described in TEMF - 3.4 Pollution - Result Statement: "Pollution threats to PANP and the regional ecosystem are identified. Impacts from pollution are eliminated, reduced or mitigated. Stakeholders are aware of pollution impacts and cooperate in mitigative action."

Value(s) at risk .. : From the Rationale section: "The key feature of this area of concern is that sources, extent of pollution impacts, and potential impacts are unknown. Localized soil contamination may occur, where petroleum was, or is presently stored, where hazardous materials are generated by park operations, and in areas of human waste disposal. A potential concern is a reduction in air quality caused by prescribed or wild fires and campfires. Use and disposal of pesticides may threaten vegetation, soil organisms and wildlife in areas that are adjacent to agricultural areas. ... The use of herbicides and biocides in the treatment of forest insect pests and broad-leafed forest species. Concerns remain over the impact that biocides, such as *Bacillus thuringiensis*, may have on birds, wildlife and non-target insects. Ecological and human effects of airborne pollutants are unknown. There may be compositional changes in the ecosystems as UV-B increases with the stratospheric ozone depletion. UV-B radiation affects vegetation negatively and this may have a disproportionately large biological impacts (sic) on some species. (There are) concerns about the contamination of water sources by *Giardia sp.* in the backcountry and the disposal of human waste in campgrounds. Other pollution sources arise from the Waskesiu town site and include storm and sanitary sewage, the golf course operations, petroleum storage area, use and disposal of hazardous materials, road maintenance activities and the potential for petroleum spills associated with the marina operation on Waskesiu Lake" (TEMF, 1994, p. 25 - 27).

OTHER AIR ISSUES

Issue ..... : N_2 and P deposition

Value(s) at risk .. : Eutrophication of Waskesiu Lake. Lake sediment cores show increased rate of sedimentation and increasing N_2 and P in sediments since 1950. Cause may be increasing atmospheric deposition due to agricultural land disturbance or local nutrient inputs from the town site.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Air quality

Location of source : Weyerhauser Pulp Mill

Frequency ..... : Daily

Type ..... : Air pollution, pesticide and herbicide applications
Location of source : Local agricultural activities to the south and southwest of the park
Frequency ..... : Seasonal

OTHER AIR ISSUE RELATED VALUES

Value ..... : ???
Air issue(s) ..... : Schindler has documented declining DOC inputs to the Experimental Lakes area, results in greater UV penetration of oligotrophic lakes, potentially threatening cold-water species such as Mysis relicta (Schindler, 1998, A Dim Future for Boreal Waters and Landscapes, Bioscience). This species occurs only in one park lake. We have no long-term data on DOC, therefore this has not been verified as to whether this problem is occurring here or not.

COMMENTS

None

PRINCE EDWARD ISLAND

Air issues contact. Phil McCabe, Prince Edward Island Field Unit
Person(s) completing the questionnaire. Philip McCabe, with update from Neil Munro

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Stanhope, #8300590
PCA name ..... : Stanhope2, #STN1???
Location ..... : 46.4164, -63.0831; 46°24'95"N, 63°04'59"W; 3.0 m asl
Type and duration : Automatic, year-round???
Properties recorded : T, P, WS, WD, snow depth, solar radiation
Start date ..... : 1961-06-01
Ownership ..... : MSC
PCA support .... : Protected site, power, communication lines

Other air monitoring stations or programmes

Name ..... : Water quality
Location ..... : Clark's Pond, Lake of Shining Waters, Rollings Pond, Long Pond, Dalvay Lake.
Properties recorded : ph, T, dissolved oxygen, salinity, conductivity
Start date ..... : 2001
Agency(ies) .... : PCA
PCA support .... : Equipment, manpower, monitoring

Name ..... : Coastal monitoring, response to global warming
Location ..... : Stanhope Beach
Properties recorded : Coastal change
Start date ..... : Mid-1980's
Agency(ies) .... : *Geological Survey of Canada*
PCA support .... : Logistics, field support

RESEARCH

Project ..... : Sea-level rise and climate change
Purpose ..... : Coastal impacts and adaptation needs
Start and end dates : 1999-2001
Agency(ies) .... : Environment Canada, Geological Survey of Canada, Department of Fisheries & Oceans, Dalhousie University, Centre for Geographic Services, Federation of Canadian Municipalities, City of Charlottetown, Province of Prince Edward Island
PCA support .... : Logistics, field support

INTERPRETATION AND OUTREACH

1. Climate Change and Canada's National Park System, 2000, Environment Canada (report)

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : LRTAP
Value(s) impacted : All water bodies
Value(s) at risk .. : Aquatic and terrestrial flora and fauna, soil, water quality

Air issue ..... : Climate change
Value(s) impacted : Sea level rise, shore erosion
Value(s) at risk .. : Coastal estuaries, Piping Plover nesting habitat

OTHER AIR ISSUES

None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Pesticides, fertilizers and herbicides
Location of source : Adjacent farmland and golf course
Frequency ..... : Seasonally - heavy rainfall events

AIR ISSUE RELATED VALUES

Value ..... : *Aster laurentianus*
Air issue(s) ..... : Global warming - sea level rise

Value ..... : Piping Plover nesting habitat
Air issue(s) ..... : Global warming - sea level rise

Value ..... : Amphibians
Air issue(s) ..... : Ground level ozone

COMMENTS

Prince Edward Island National Park is affected by the LRTAP that originates in the northeast United States and central Canada. Acidic precipitation and anomalously high concentrations of ground level ozone are the most important known consequences of LRTAP. Acid precipitation can negatively affect vegetation, soil, water quality and aquatic and terrestrial animals. There is no ground level O_3 monitoring site within the Park. A provincial monitoring site is located at Cardigan. The Island's ground water has a moderately high buffering capacity that minimizes the effect of acidic precipitation. A water quality monitoring program was initiated in five park water bodies in 2001. A likely effect of climate change is a rising global sea level. This rise could have a significant effect on the park, such as loss of flora and fauna habitat, dune migration, intrusion of saltwater into freshwater ponds, etc..

PUKASKWA

Air issues contact. Dan Couchie, Northern Ontario Field Unit
Person(s) completing the questionnaire. Mike Small

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Pukaskwa Natl Park, #6046770
Location ..... : Outside??? 48.6000, -86.3000; 48°36'00"N, 86°18'00"W; 192.0 m asl
Type and duration : Manual, ???
Properties recorded : T, P, WS, WD
Start date ..... : 1983-07-01
Ownership ..... : ???
PCA support .... : ??? This station was not identified by the park

MSC name ..... : Pukaskwa (AUT), #6046767
PCA name ..... : Hattie Cove, #PUWCJ
Location ..... : 48.5883, -86.2947; 48°35'18"N, 86°17'41"W; 207.6 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, pressure
Start date ..... : 1993-01-04
Ownership ..... : MSC
PCA support .... : Routine service, data transfer

PCA name ..... : Otter Cove, #PUOTT
Location ..... : 48.0916, -85.9647; 48°05'30"N, 85°57'53"W
Type and duration : Automatic, year-round

Properties recorded: T, P, RH, WS, WD
Start date ..... : 1993-05-??
Ownership ..... : PCA
PCA support .... : Maintenance, operation; technical support by Campbell Scientific

PCA name ..... : Soldier Mountain, #PUSOL
Location ..... : 48.3902, -85.7558; 48°23'25", 85°45'21"W
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1993-05-??
Ownership ..... : PCA
PCA support .... : Maintenance, operation; technical support by Campbell Scientific

RESEARCH

Project ..... : Passive air sampling for persistent organic pollutants
Purpose ..... : Investigating the distribution of persistent organic pollutants in the North American atmosphere using passive air samplers.
Start and end dates : One year project ending May 2002
Institution ..... : Frank Wania, Assistant Professor, University of Toronto
PCA support .... : Installing, retrieving and shipping passive air samplers

INTERPRETATION AND OUTREACH

1. Acid Rain Pamphlet, Environment Canada, distributed at the park visitor centre
2. Acid Rain Video at the park visitor centre

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : LRTAP
Value(s) impacted : Abundance and distribution of lichen species
Value(s) at risk .. : ???

Issue ..... : Climate change
Value(s) impacted : ???
Value(s) at risk .. : Precipitation, temperature, insolation

OTHER AIR ISSUES

Issue ..... : Acid deposition
Value(s) impacted : A study of 59 lakes has shown 32 to be extremely sensitive to acidification. The Precambrian bedrock and glacial till found in Pukaskwa has little potential to buffer acidity.
Value(s) at risk .. : Increased acidification affecting soil and lakes will lead to the degradation of parks terrestrial and aquatic habitats. Species abundance and composition could easily be affected by increased acid precipitation, such as white pine, white birch and red maple.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Pulp and paper mill emissions
Location of source : Marathon Pulp Inc., 20 km northwest of Pukaskwa
Frequency ..... : Daily, year-round

AIR ISSUE RELATED VALUES

Value ..... : Lichen
Air issue(s) ..... : LRTAP

Value ..... : White pine
Air issue(s) ..... : LRTAP

Value ..... : White birch
Air issue(s) ..... : LRTAP

Value ..... : Red maple
Air issue(s) ..... : LRTAP

COMMENTS

The Pukaskwa National Park Management Plan identifies the need to work with federal and provincial agencies that are monitoring LRTAP in the Greater Pukaskwa Ecosystem. The Ecosystem Conservation Plan identifies: 1) air quality as an indicator and measured by abundance, distribution of lichen species sensitive to air pollution; and 2) climate, with precipitation type and frequency, temperature and insolation as indicators. The operational plan calls for the monitoring of climate change using current weather stations and summarizing data annually, and air quality using data on wet sulphate depositions and total rainfall from surrounding MSC weather stations. The Pukaskwa Fire Management Plan identifies the need to prevent negative impacts on air quality.

As mentioned above the park is working with various local and regional government agencies as well as non-government organizations concerning climate change and air quality issues. However, to do more, especially as outlined in the park's Ecosystem Conservation Plan, more funding is required to do more in-park studies, e.g. air quality study using lichens as indicators. Until then, monitoring temperature, wind speed and direction, relative humidity and precipitation is all we can do.

The maintenance of the two permanent park weather stations is becoming costly. The system is getting old and funding for an upgrading is necessary to maintain the integrity of the data.

QUTTINIRPAAQ

Air issues contact. Vicki Sahanatien, Nunavut Field Unit
Person(s) completing the questionnaire. Paula Hughson, Nunavut Field Unit, and Marco Dussault for climate stations.

PROGRAMMES

MONITORING

Weather stations

PCA name ..... : Fort Conger
Location ..... : 81.7523, -64.83202; 81°45'08"N, 64°49'55"W
Type and duration : Automatic, year-round
Properties recorded : T, RH, WS, WD, snow depth, soil temperature (20 cm deep)
Start date ..... : 1988
Ownership ..... : PCA
PCA support .... : Purchased sensors and equipment, installation, annual maintenance and downloading of data, logistical support, cleaning and archiving of data (done by arrangement with Campbell Scientific)

PCA name ..... : Lake Hazen
Location ..... : 81.8248, -71.3346; 81°49'30"N, 71°20'05"W
Type and duration : Automatic, year-round
Properties recorded : T, RH, WS, WD, snow depth, soil temperature (20 cm deep)
Start date ..... : 1988
Ownership ..... : PCA
PCA support .... : Purchased sensors and equipment, installation, annual maintenance and downloading of data, logistical support, cleaning and archiving of data (done by arrangement with Campbell Scientific)

PCA name ..... : Tanquary Fiord
Location ..... : 81.4040, -76.8750; 81°24'15"N, 76°52' 30"W
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, solar radiation, net radiation, snow depth, soil temperature (20 cm deep)
Start date ..... : 1988
Ownership ..... : PCA
PCA support .... : Purchased sensors and equipment, installation, annual maintenance and downloading of data, logistical support, cleaning and archiving of data (done by arrangement with Campbell Scientific)

PCA name ..... : Ward Hunt
Location ..... : 83.09334, -74.16293; 83°05'36"N, 74°09'47"W
Type and duration : Automatic, year-round
Properties recorded : T, RH, WS, WD, snow depth, soil temperature (20 cm deep)
Start date ..... : 1996
Ownership ..... : PCA
PCA support .... : Purchased sensors and equipment, installation, annual maintenance and downloading of data, logistical support, cleaning and archiving of data (done by arrangement with Campbell Scientific)

Other air monitoring stations or programmes

Name ..... : International Tundra Experiment

Location ..... : Tanquary Fiord
Properties recorded: Plant phenology - purple saxifrage (*Saxifraga oppositifolia)*, mountain avens (*Dryas integrifolia)*
Start date ..... : 1998
Agency(ies) .... : PCA
PCA support .... : Take measurements and summarize data

Name ..... : Landscape monitoring using AVHRR images
Location ..... : Entire park
Properties recorded: Snow cover, vegetation productivity
Start date ..... : 1984, first available image
Agency(ies) .... : PCA
PCA support .... : Purchase images, process images and interpret

Name ..... : Circumpolar Active Layer Monitoring
Location ..... : Tanquary Fiord
Properties recorded: Permafrost depth
Start date ..... : 1997
Agency(ies) .... : PCA, University of Ottawa
PCA support .... : Take measurements and summarize data

RESEARCH
None

INTERPRETATION AND OUTREACH
1. Visitor information package - summaries of historic monthly weather conditions are provided for public safety reasons.
2. Community and visitor interpretation of monitoring programmes

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AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : ???
Value(s) at risk .. : Change in vegetation productivity; change in availability and quality of wildlife habitat.

OTHER AIR ISSUES

Issue ..... : LRTAP
Value(s) impacted : Health of plants and animals
Value(s) at risk .. : Vegetation productivity, water quality, and fish species productivity, survivability and quality as a food source.

Issue ..... : Increased UV-B radiation
Value(s) impacted : Greater risk of sunburns for people
Value(s) at risk .. : Vegetation; park staff and visitors

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES
None

COMMENTS
None

RIDING MOUNTAIN
Air issues contact. Doug Bergeson, Riding Mountain National Park Field Unit
Person(s) completing the questionnaire. Doug Bergeson

PROGRAMMES
MONITORING
Weather stations
MSC name ..... : Wasagaming, #5013117
PCA name ..... : Wasagaming AES
Location ..... : 50.3921, -99.5625; 50°23'32"N, 99°33'45"W; 627.4 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, pressure
Start date ..... : 1966-03-01
Ownership ..... : MSC
PCA support .... : Site in the park
Note: MSC locates this station at 50°39'00"N, 99°56'00"W, i.e. possibly the same as the decimal values tendered by the park. Either could be right.

Fire weather stations
PCA name ..... : Deep Lake, #RMDEP
Location ..... : 50.5144, -100.5030; 50°30'52"N, 100°30'11"W; 677.0 m asl
Type and duration : Automatic, seasonal 1st April to 31st October
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1986
Ownership ..... : PCA
PCA support .... : Owned and operated

PCA name ..... : Kippens Mill; #RMKIP
Location ..... : 50.5220, -100.0226; 50°31'19"N, 100°01'21"W; 726.0 m asl
Type and duration : Automatic, seasonal 1st April to 31st October
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1986
Ownership ..... : PCA
PCA support .... : Owned and operated

Other air monitoring stations or programmes
None

RESEARCH
None

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : None
Value(s) at risk .. : Habitat loss/change

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Agricultural pesticides
Location of source : Farms surrounding the park
Frequency ..... : Summer for pesticides, Fall for smoke

Type ..... : Enrichment by agricultural dust
Location of source : Farms surrounding the Park
Frequency ..... : Summer for pesticides, Fall for smoke

Type ..... : Biomass burning - agriculture
Location of source : Surrounding farms
Frequency ..... : Fall

Type ..... : Small boat emissions
Location of source : Clear Lake, Audy Lake, Moon Lake, surrounding lakes
Frequency ..... : Summer

Type ..... : Town site maintenance, small engine emissions, weed trimmers, chainsaws
Location of source : Clear Lake town site and trail systems
Frequency ..... : Summer

AIR ISSUE RELATED VALUES

Value ..... : People on the marina while boats are operating
Air issue(s) ..... : Boat exhaust - PM, VOCs, CO

Value ..... : Species composition in favour of exotics

Air issue(s) ..... : Dust along the roads

Value ..... : Visibility and quality experience of visitors
Air issue(s) ..... : Smoke in fall from agricultural burning

Value ..... : Fire fighters' respiratory systems
Air issue(s) ..... : Smoke during wildfires and prescribed burning

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COMMENTS

As Riding Mountain National Park is surrounded by farmland most concerns would be with agricultural practices.

SAGUENAY SAINT-LAURENT

Personne ressource pour les enjeux atmosphériques. Nadia Ménard, Unité de gestion PMSSL

Personne qui remplit le questionnaire. Sébastien Marcoux, PMSSL

PROGRAMMES

SURVEILLANCE

Stations météorologiques

Nom SMC ..... : Cap Rouge, #7041166
Nom APC ..... : Cap Rouge
Emplacement ..... : 48.3747, -70.5354; 48°22'20"N, 70°32'07"O; 7.0 m asl
Type et durée ..... : Automatisée, toute l'année?
Propriétés notées ..... : T, P, HR, VV, DV
Date de début ..... : 1993-12-14
Organisme ..... : Protocole d'entente entre le PMSSL et SMC, région du Québec, d'une durée de 15 ans.
Type de soutien de APC . : Achat de l'équipement (15 500 $), support logistique

Nom SMC ..... : Ile Rouge, #7043BP9
Nom APC ..... : Ile Rouge
Emplacement ..... : 48.0688, -69.5555; 48°04'00"N, 69°33'00"O; 5.9 m asl
Type et durée ..... : Automatisée, toute l'année
Propriétés notées ..... : T, P, VV, DV, point de rosée, pression
Date de début ..... : 1984-08-24
Organisme ..... : Ministère de Pêches et Océans
Type de soutien APC ... : Situé sur un île entouré par des eaux du parc

Nom SMC ..... : Pointe à Claveau, #704607C
Nom APC ..... : Pointe à Claveau
Emplacement ..... : 48.2606, -70.1144; 48°15'38"N, 70°06'52"O; 4.0 m asl

Type et durée	:	Campbell scientific 21 XL
Propriétés notées	:	T, P, HR, VV, DV
Date de début	:	1993-12-14
Organisme	:	Protocole d'entente entre le PMSSL et SMC, région du Québec, d'une durée de 15 ans.
Type de soutien de APC	:	Achat de l'équipement (15 500 $), support logistique

Nom APC	:	Pointe de l'Islet
Emplacement	:	48.1347, -69.7165; 48°08'05"N, 69°42'59"O; 7.0 m asl
Type et durée	:	Automatisée, toute l'année?
Propriétés notées	:	T, P, HR, VV, DV
Date de début	:	1993
Organisme	:	Protocole d'entente entre le PMSSL et SMC, région du Québec, d'une durée de 15 ans.
Type de soutien de APC	:	Achat de l'équipement (15 500 $), support logistique

Autres stations ou programmes de surveillance de la qualité de l'air
Aucun autre programme

RECHERCHE

Projet	:	Collection et examen post-mortem des carcasses des bélugas échoués le long des rives de l'estuaire du Saint-Laurent.
But	:	Recherche sur les causes de mortalité des bélugas, permet de mesurer les d'HAP dans les carcasses (lien avec pollution atmosphérique provenant des alumineries).
Date de début et de fin	:	Depuis 1993 et revue à chaque année
Organisme(s)	:	Ministère des Pêches et Océans, Institut National d'Écotoxicologie du Saint-Laurent, l'Université de Montréal, PMSSL
Type de soutien de APC	:	Couvrir certains frais de main d'oeuvre et de matériel de laboratoire engagés par l'Université de Montréal; fournir un maximum de 10 000 $ pour les examens post-mortem, soit 1 250 $ par carcasse pour un maximum de 8 carcasses par année.

INTERPRÉTATION ET COMMUNICATIONS EXTÉRIEURES

1. Présentation par le Groupe de Recherche et d'Éducation sur le Milieu Marin (partenaire du PMSSL) de l'activité "Capitaine Météo" qui vise à sensibiliser les visiteurs aux conditions météorologiques, plus particulièrement à celles de l'embouchure du Saguenay. Incite à l'utilisation du service téléphonique de la météo et à consulter les babillards affichant les prévisions météo.
2. Ligne téléphonique sur les conditions météorologiques et les conditions routières en collaboration avec Environnement Canada et Transports Québec accessible au publique.

ENJEUX ATMOSPHÉRIQUES ET RESSOURCES CONNEXES

ENJEUX ATMOSPHÉRIQUES TRAITÉS DANS LES DOCUMENTS ACTUELS DE GESTION DES PARCS

Enjeu ..... : Déversements industriels toxiques
Valeur(s) en péril ..... : Oiseaux, mammifères marins, poissons, benthos, zooplancton, phytoplancton.

Enjeu ..... : Rejets agricoles
Valeur(s) en péril ..... : Oiseaux, mammifères marins, poissons, benthos, zooplancton, phytoplancton.

Le Plan de Conservation PMSSL identifie en détails les sources de contaminants, leurs impacts respectifs sur les ressources du PMMSL ainsi que les actions en cours et recommandées pour contrer ces effets. De plus, la présence de sources diffuses de pollution des eaux (ruissellement des pesticides et engrais utilisés en agriculture et des polluants transportés sur de longues distances par le vent ou par l'eau) ainsi que la menace réelle qu'elles présentes pour les ressources du PMSSL est identifié dans le plan directeur.

AUTRES ENJEUX ATMOSPHÉRIQUES

Enjeu ..... : Gaz d'échappement des moteurs des bateaux en activité d'observation des mammifères marins.
Valeur(s) en péril ..... : Mammifères marins

Enjeu ..... : Gaz d'échappement des navires commerciaux, de plaisance, du Garde côtière et du PMSSL qui demeurent en marche pour de longue durée à quai et/ou lors d'activités d'observation en mer.
Valeur(s) en péril ..... : Les usagers (affectés) et les mammifères marins.

Enjeu ..... : Réchauffement climatique
Valeur(s) en péril ..... : Écosystème marin en entier car une baisse du débit du Saint-Laurent suite à une baisse des niveaux d'eau des Grands Lacs tel que prédit dans les modèles de réchauffement climatiques affecterait les conditions océanographiques responsable de la richesse biologique de l'estuaire du Saint-Laurent et du Saguenay. Conséquence sur la circulation des masses d'eau dans le Saint-Laurent en affectant le niveau des eaux douces. Ceci aurait pour conséquence de perturber l'apport et la production des premiers maillons du réseau trophique marin.

IMPORTANTES SOURCES LOCALES DE POLLUTION

Type ..... : Bateaux, cargos et paquebots, gaz d'échappement
Emplacement de la source : Les quais, les sites d'observations des mammifères marins et le chenal de navigation commercial.
Fréquence ..... : Du début mai à octobre, mais à l'année pour cargos

Type ..... : Pesticides

Emplacement de la source : Les terres agricoles entourant le parc et les cours d'eau en amont
Fréquence ..... : Selon l'utilisation, printemps, été et à la fonte des neiges

Type ..... : Fumée de scieries
Emplacement de la source : Exemple, la Boisaco de Sacré Coeur
Fréquence ..... : Fumée continue

Type ..... : Fumée des alumineries
Emplacement de la source : Alma, Jonquière
Fréquence ..... : À l'année longue

Type ..... : Fumée des résidences qui chauffent au bois
Emplacement de la source : Toutes les villes et villages bordant le parc marin
Fréquence ..... : Automne, hiver, printemps

Type ..... : Émanations des camions effectuant le transport routier.
Emplacement de la source : Routes principales
Fréquence ..... : À l'année longue

VALEURS AFFECTÉES PAR LA QUALITÉ DE L'AIR
Valeur ..... : Production primaire, phytoplancton et zooplancton
Enjeu(x) atmosphérique(s) : Il a été démontré en Antarctique que les rayons UV nuisent au développement des oeufs et jeunes stades planctonique dans l'eau, stérilisent le microbes et ont un impact sur les invertébrés et les algues.

COMMENTAIRES
Aucune

SAINT LAWRENCE ISLANDS
Air issues contact. Jeff Leggo, Eastern Ontario Field Unit
Person(s) completing the questionnaire. Jeff Leggo

PROGRAMMES
MONITORING
Weather stations
MSC name ..... : Grenadier Island, #6103024
PCA name ..... : Grenadier Island SLINP, #FIRE
Location ..... : 44.4177, -75.8529; 44°25'04"N, 75°51'10"W; 82.0 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, pressure
Start date ..... : 1992-09-10
Ownership ..... : MSC

PCA support .... : None

Other air monitoring stations or programmes
None

RESEARCH
Project ..... : Influence of chemical and environmental factors on the Saint Lawrence River ecosystem.
Purpose ..... : Multi-disciplined view of ecosystem health
Start and end dates : October 1999
Agency(ies) .... : University of Ottawa
PCA support .... : In-kind operational support

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Air quality
Value(s) impacted : ???
Value(s) at risk .. : Mosses, salamanders

OTHER AIR ISSUES
Issue ..... : Ground level ozone
Value(s) impacted : ???
Value(s) at risk .. : ???

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
There are very few significant local sources of air pollution with in the greater park ecosystem

AIR ISSUE RELATED VALUES
Value ..... : Herpetofaunal diversity
Air issue(s) ..... : Acid deposition, other chemical air pollutants, ground-level ozone

Value ..... : Pitch pine regeneration
Air issue(s) ..... : Ground level ozone

Value ..... : Aquatic species diversity
Air issue(s) ..... : Acid deposition
In lakes and wetland habitats on the granite corridors of the Frontenac Axis, the water is not buffered by the limestone bedrock of the Saint Lawrence Lowlands. Increased acidity may effect species diversity.

COMMENTS

SLINP provides Canada's highest level of natural heritage protection to all or part of 21 islands in the Saint Lawrence River. The park is located on Eastern Ontario's Frontenac Axis, a continental scale landform that connects the Canadian Shield with the Adirondack Mountains of New York State. This biogeographic feature allows for long term movement of flora and fauna through the natural barrier of the Great Lakes - Saint Lawrence River, and is one of the major genetic migration corridors of North America. The Thousand Island Ecosystem is an area approximately 80 km by 40 km from Kingston to Brockville, and Watertown to the Rideau Canal. The landscape has a diverse mixture of typical southern Ontario land use (e.g. urban development, agriculture) and a combination of deciduous and conifer forest cover. There is a very high species diversity of fishes and herptiles, and the area supports one of the highest biodiversity levels of all Canadian national parks.

SIRMILIK

Air issues contact. Vicki Sahanatien, Nunavut Field Unit

Person(s) completing the questionnaire. Paula Hughson, Nunavut Field Unit, and Marco Dussault for climate stations.

PROGRAMMES

MONITORING

Weather stations

Name ..... : Bylot 1
Location ..... : 73.1500, -80.0050;73°09'00"N, 80°00'18"W; 20.0 m asl
Type and duration : Automated, year-round
Properties recorded : Soil surface temperature (2 cm deep) at 10 sites (5 sites grazed by geese, 5 sites ungrazed by geese, i.e. within enclosure). Frequency: average, min. and max daily values.
Start date ..... : 1992
Agency ..... : Laval University
PCA support .... : None

Name ..... : Bylot 2
Location ..... : 73.1550, -79.9537;73°09'18"N, 79°57'13"W; 20.0 m asl
Type and duration : Automated, year-round
Properties recorded : T (at 2.5 m), RH, WS, WD (at 3 m), soil temperature (at depth of 2 and 10 cm), total solar radiation, PAR radiation, snow depth. Frequency: average values recorded hourly; min and max values daily.
Start date ..... : 1994
Agency ..... : Laval University
PCA support .... : None

Name ..... : Bylot 3
Location ..... : 73.1417, -79.9017; 73°08'30"N, 79°54'06"W; 370.0 m asl
Type and duration : Automated, year-round

Properties recorded: T (at 2.5 m), RH, WS, WD (at 3 m), soil temperature (at depth of 2 and 10 cm). Frequency: average values recorded hourly; min and max values daily.
Start date ..... : 2001
Agency ..... : Laval University
PCA support .... : None

Other air monitoring stations or programmes
Name ..... : International Tundra Experiment (ITEX)
Location ..... : 73°00'00"N, 80°00'00"W
Properties reported : Plant phenology
Start date ..... : 1994
Agency(ies) .... : Laval University
PCA support .... : None

RESEARCH
None

INTERPRETATION AND OUTREACH
1. Community and visitor interpretation of monitoring programmes

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AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS
None

OTHER AIR ISSUES
Issue ..... : LRTAP
Value(s) impacted : Health of plants and animals
Value(s) at risk .. : Effects on vegetation productivity, water quality, and fish species productivity, survivability and quality as a food source.

Issue ..... : Increased UV-B radiation
Value(s) impacted : Greater risk of sunburn for people
Value(s) at risk .. : Effects on vegetation, effects on park staff and visitors

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
Type ..... : Diesel electricity generating station
Location of source : Pond Inlet and Arctic Bay
Frequency ..... : Non stop year-round

Type ..... : Open air burning of household waste
Location of source : Pond Inlet and Arctic Bay
Frequency ..... : Non stop year-round

AIR ISSUE RELATED VALUES

None

COMMENTS

None

TERRA NOVA

Air issues contact. Randy Power, Newfoundland East Field Unit
Person(s) completing the questionnaire. Randy Power, with update from Neil Munro

PROGRAMMES

MONITORING

Weather stations

PCA name ..... : Bluehill West
Location ..... : 48.5903, -53.9897; 48°35'25"N, 53°59'23"W
Type and duration : Automatic, ???
Properties recorded : T, P, RH, WS, WD, soil temperature, solar radiation
Start date ..... : 1999-09-??
Ownership ..... : Parks Canada, Environment Canada EMAN
PCA support .... : Equipment purchase, project management, data archive; microclimate change in conjunction with herbivore exclosures and permanent plant biodiversity monitoring plots.

PCA name ..... : Park Harbor
Location ..... : 48.5286, -53.8058; 48°31'43"N, 53°48'21"W
Type and duration : Automatic, seasonal???
Properties recorded : T, P, RH, WS, WD, solar radiation
Start date ..... : 2001-08-01; this station recorded 2½ years data at another site before relocation.
Ownership ..... : Parks Canada, for prescribed burn programme
PCA support .... : Equipment purchase, maintenance, data archive

These next two stations may be the same, with the "CS" station replacing the "HQ" station. However, MSC shows the second as being still active.

MSC name ..... : Terra Nova Nat Park CS, #8403851
PCA name ..... : TNPCS (Headquarters), #TNPCS
Location ..... : 48.5569, -53.9744; 48°33' 25"N, 53°58' 28"W; 106.7 m asl
Type and duration : Automatic, year-round???
Properties recorded : T, P, RH, WS, WD, etc.
Start date ..... : 1962-01-01, replaced 1996-06-01
Ownership ..... : MSC
PCA support .... : Equipment purchase

Other air monitoring stations or programs

Name ..... : Monitoring stream flow and water chemistry
Location ..... : Big Pond - Minchin Brook watershed
Properties recorded : Stream flow and water chemistry
Start date ..... : Summer 2000
Agency(ies) .... : Memorial University of Newfoundland
PCA support .... : Equipment purchase, logistic support

Name ..... : LRTAP
Location ..... : Throughout park
Properties recorded : Acid rain deposition
Start date ..... : On-going
Agency(ies) .... : Environment Canada
PCA support .... : Bi-annual water sample collection

RESEARCH
None

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Acid rain deposition
Value(s) impacted : Aquatic systems
Value(s) at risk .. : Integrity of aquatic and soil ecosystems

Issue ..... : Climate change
Value(s) impacted : Unknown
Value(s) at risk .. : Terrestrial and aquatic systems, intertidal zones

OTHER AIR ISSUES

Issue ..... : UV-B and ozone depletion
Value(s) impacted : Unknown
Value(s) at risk .. : Aquatic and terrestrial ecosystems

Issue ..... : Vehicle exhaust from Trans-Canada Highway and secondary roads
Value(s) impacted : Unknown
Value(s) at risk .. : Roadside terrestrial ecosystems

Issue ..... : Exhaust from motorized water craft
Value(s) impacted : Unknown
Value(s) at risk .. : Aquatic and terrestrial ecosystems

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Local landfill site

Location of source : Northwest of park
Frequency ..... : Ongoing - higher in Winter months

Type ..... : Vehicle exhaust
Location of source : Throughout park
Frequency ..... : Ongoing, higher in Summer months

AIR ISSUE RELATED VALUES
None identified

COMMENTS

Excerpt from the park's ecological integrity statement (citations removed)
"Air Issues
"Airborne pollutants result in wet (acid rain, snow and fog) and dry acidic deposition of deleterious chemicals across the landscape. Effects of acid rain on forest ecosystems include decreases in net photosynthesis and nutrient uptake, lower germination rates, soil nutrient decline, alteration of the chemical and physical structure of leaves, decreased frost hardiness, chemical imbalances, and increases in respiration. Significant impacts are also known for aquatic ecosystems.

"The current sulphate deposition in TNNP, for example, is 7.08 kg/ha/yr which is slightly less than the 8 kg/ha/yr limit proposed but well below the present Canadian target load of 20 kg/ha/yr. The three year average PH (1994-96) for total precipitation in TNNP is 4.83 while surface waters in 1994 had a measured high and low of 6.4 and 5.1 respectively. Neutral water has a PH of 7.0 and normal rain 5.6. The 1996 low for precipitation was 3.79 while acid fog, which may impact sensitive arboreal lichen communities, has been shown to have a PH as low a 2.0.

"While debate continues, there is a growing consensus in the scientific community about the realities of global climate change. The sensitivity of TNNP's coasts to sea level rise is considered low with a projected 0.5 m sea level rise by 2100. Temperature change predictions are more dire even though TNNP is projected to experience the smallest temperature increase under doubled-CO_2 conditions of all the national parks in Canada. When four climate models - using doubled-CO_2 by 2050 - were evaluated, the seasonal temperature changes for TNNP were projected to be an increase of 2 to 5°C. A similar analysis for projected changes of precipitation resulted in predictions of -11 to +16% changes depending on the season.

"While these temperature and precipitation changes are well within or below the ranges experienced during natural fluctuations of the last 20,000 years, the present changes are occurring at unprecedented rates to which ecosystems will have difficulty adapting. Predicted changes in snow cover, for example, may benefit some species such as moose whose winter browsing is restricted by deep snow while hindering others such as endangered Newfoundland marten which rely on subnivean habitats for hunting and energetic purposes. Changing snow cover patterns are also thought to affect tree seedling survival. On the other

hand, both higher summer and winter temperatures can have an overall negative effect on the energetic balance of moose which experience heat stress when ambient air temperatures rise above -5°C in winter and above 14°C in summer.

"Debate also continues as to whether or not global warming will increase or decrease the number of forest fires under various increased CO_2 scenarios. Furthermore, the boreal forests play a critical role in the global carbon cycle acting as an enormous carbon reservoir. As boreal forests are cleared, burn more frequently, and break up due to climate change, vast quantities of carbon are fed back into the atmosphere in a positive biospheric feedback loop exasperating the greenhouse effect.

"By some predictions, a doubling of CO_2 is predicted to result in a 900 km northward shift of the boreal forest. Since species are unlikely to be able to respond to the predicted rate of change, some projections under doubled-CO_2 modelling predict that 50 to 90% of boreal forests are likely to disappear by 2050! In order to track the projected, multifarious effects of global climate change in boreal ecosystems, a suitable suite of ecological monitoring indicators will be established. Ozone depletion, the attendant increase in transmission of ultra-violet wavelengths and the resultant damage to living tissues, including DNA, is also an air issue of concern."

Problems with operation of weather stations
The lack of a specific, dedicated, full-time staff member to oversee periodic inspection and maintenance of the stations.

TUKTUT NOGAIT

Air issues contact. Ian McDonald, Western Arctic Field Unit
Person(s) completing the questionnaire. Ian McDonald

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Tuktut Nogait, #2203918
PCA name ..... : Melville Hills
Location ..... : 69.1928, -122.3539; 69°11'34"N, 122°21'14"W; 551.6 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD, incoming shortwave radiation (RF1), dew point, snow fall and depth, barometric and vapour pressure.
Start date ..... : 1998-07-25
Ownership ..... : PCA
PCA support .... : Purchase and installation, routine service, data transfer

MSC name ..... : Qavvik Lake, #2203341
PCA name ..... : Qavvik Lake
Location ..... : 68.2256, -122.0206; 68°13'32"N, 122°01'14"W; 530.0 m asl

Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, incoming shortwave radiation (RF1), dew point, snow fall and depth, barometric and vapour pressure, UV-B radiometer.
Start date ..... : 1999-07-07
Ownership ..... : PCA
PCA support .... : Purchase and installation, routine service, data transfer

Other air monitoring stations or programmes
None

RESEARCH
None

INTERPRETATION AND OUTREACH
1. Annual research and monitoring report, 1999 and 2000, PCA Western Arctic Field Unit
2. Environmental Stewardship Programme, PCA Western Arctic Field Unit

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AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : Habitat (e.g vegetation, permafrost, etc.) and wildlife
Value(s) at risk .. : ???

Issue ..... : LRTAP
Value(s) impacted : ???
Value(s) at risk .. : Water quality, wildlife and habitat, human health

OTHER AIR ISSUES
None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES
None

AIR ISSUE RELATED VALUES
Value ..... : Permafrost
Air issue(s) ..... : Climate change

Value ..... : Tundra habitat
Air issue(s) ..... : Climate change, vegetation change

Value ..... : Water quality
Air issue(s) ..... : LRTAP

COMMENTS
None

VUNTUT
Air issues contact. David Henry, Yukon Field Unit
Person(s) completing the questionnaire. David Henry and Rhonda Markel, Yukon Field Unit

PROGRAMMES
MONITORING
Weather stations
None

Other air monitoring stations or programmes

Name	:	Climate change, primary productivity - AVHRR
Location	:	Northern parks including Vuntut
Properties recorded	:	Monitoring of plant productivity, seasonal patterns of growth, length of growing season, landscape fragmentation.
Start date	:	1998
Agency(ies)	:	PCA
PCA support	:	Majority of funding

Name	:	Ecological Monitoring Programme of the Arctic Borderlands Ecological Knowledge Cooperative.
Locations	:	Old Crow, Porcupine River
Properties recorded	:	Community-based monitoring: break-up date for Porcupine River, permafrost monitoring station near Old Crow.
Start date	:	1996
Agency(ies)	:	Environment Canada with multi partners
PCA support	:	Participation in the monitoring network and meetings

RESEARCH

Project	:	Chapter on climate in the Vuntut Resource Description and Analysis
Purpose	:	Review and synthesize information sources on local climate and make recommendations for research.
Start and end dates	:	1998-2000
Agency(ies)	:	PCA
PCA support	:	All

Project	:	Hydrology and climate change of Old Crow Flats
Purpose	:	Examine changing water levels of lakes in the Old Crow Flats
Start and end dates	:	1998-2000
Agency(ies)	:	CWS and Laval University
PCA support	:	Logistic support

Project ..... : Food contaminants study in the northern Yukon
Purpose ..... : Examination of country foods for the presence of airborne or waterborne contaminants.
Start and end dates : 1996-1998
Agency(ies) .... : DIAND and the Arctic Borderlands Ecological Knowledge Cooperative
PCA support .... : None

Project ..... : Primary productivity
Purpose ..... : Monitoring of length of growing season, seasonal patterns, plant productivity and landscape fragmentation, using AVHRR satellite sensor
Start and end dates : 1999-ongoing
Agency(ies) .... : PCA
PCA support .... : Majority of support

INTERPRETATION AND OUTREACH

1. Interpretive display concerning the changing hydrology of the Old Crow Flats exhibited at several public meetings in Old Crow and Whitehorse.
2. VNP Resource Description and Analysis has been formatted onto a self-contained CD so as to make it more widely available. It has been distributed to Yukon Education Department, selected researchers and libraries and made available on PCA Intranet.
3. www.Taiga.net. This is a major site for dissemination of information about the northern Yukon, northwestern NWT and northern Alaska. Several agencies and organizations have published reports on this website including CWS, PCA, DIAND, Northern Climate Exchange and the Arctic Borderlands Ecological Knowledge Cooperative.

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Climate change
Value(s) impacted : Local climate and water levels in lakes, hydrology (larger spring runoffs), increased riparian slumping and erosion, fish, waterfowl and mammalian populations in the Old Crow Flats, snow depth, growing season, melting of permafrost and increase of the active layer, vegetation and animal communities, location of treeline.
Value(s) at risk .. : Risks to humans and animals from changes in ice thickness, ice damming and flooding, increased sediment load in rivers and creeks, large-scale mass wasting, peat plateaux, palsas, thermokarst features, ice wedge polygons, patterned ground, distribution of plant and animal populations, invasions of exotic species frequency, size of forest fires, distribution, seasonal habitat use and numbers of moose and caribou populations and related predators such as wolves and grizzly bears, loss of paleontological and archaeological sites damage to roads, buildings and other human infrastructure.

OTHER AIR ISSUES

Issue ..... : LRTAP
Value(s) impacted : Research has shown no significant impacts currently documented
Value(s) at risk .. : Future possible accumulation of pollutants in trophic levels of ecosystems and in human foods.

Issue ..... : UV-B
Value(s) impacted : ???
Value(s) at risk .. : Possible increased incident of cataracts, skin cancer and immune system deficiencies in wildlife and humans; altered photosynthesis rates in aquatic ecosystems.

Issue ..... : Hazardous air pollutants - cold condensation
Value(s) impacted : Aquatic organisms, aquatic ecological processes
Value(s) at risk .. : Aquatic and waterfowl populations

Issue ..... : Oil and gas development emissions
Value(s) impacted : ???
Value(s) at risk .. : Possible impacts on Porcupine Caribou Herd and other wildlife populations, impacts of site development, possible impacts on aquatic ecosystems and localized air quality.

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Contaminants from abandoned fuel drums
Location of source : Various locations
Frequency ..... : Minimal inside the park, unknown outside the park

Type ..... : Smoke and air quality from wildfires
Location of source : Unpredictable locations
Frequency ..... : Less than once per year

Type ..... : Engine emissions - recreational and operational two stroke engines
Location of source : Non-point - snow machines, ATVs, boat motors
Frequency ..... : Seasonal variation. Traditional snow machine and boat routes concentrate pollutants and erosional/permafrost impacts.

AIR ISSUE RELATED VALUES

Value ..... : Ungulates - moose and caribou population level and health
Air issue(s) ..... : Climate change, LRTAP

Value ..... : Human health and amenity
Air issue(s) ..... : Climate change, LRTAP, Arctic haze, contaminants in country food

Value ..... : Landforms - permafrost, slumping, erosion
Air issue(s) ..... : Climate change

Value ..... : Archaeological and paleontological resources
Air issue(s) ..... : Climate change

Value ..... : Vegetation - species distribution, productivity
Air issue(s) ..... : Climate change, LRTAP, Arctic haze

COMMENTS

VNP is an isolated, relatively pristine national park located in the northern Yukon. Its isolation temporarily protects it from many air-quality related impacts experienced in more southern national parks. Global climate change is a significant environmental concern for VNP. From the comments given above, the potential impacts of global climate change are multiple and potentially serious to the northern ecosystem found in the park and in surrounding areas. Global climate change will also have significant impacts for northern human communities such as the Village of Old Crow.

Parks Canada is in the process of developing an ecological monitoring programme for VNP. It may include weather monitoring stations inside the park. This programme will be designed to support existing monitoring programmes, such as the one conducted by the Arctic Borderlands Ecological Knowledge Cooperative. VNP's monitoring programme will foster close cooperation among partners, such as Canadian Wildlife Service, Yukon Territorial Government, Vuntut Gwitchin First Nation, Ivvavik National Park and the Arctic National Wildlife Refuge, in order to promote a regionally integrated approach to ecological monitoring.

The Vuntut Gwitchin Oral History Project which is now in its third year of operation will be able to document important traditional ecological knowledge related to recent changes in weather, plant distribution and animal abundance as well as changes possibly related to global climate change.

WAPUSK

Air issues contact. Carole Loiselle, Manitoba Field Unit
Person(s) completing the questionnaire. Bob Reside

PROGRAMMES

MONITORING

Weather stations
None

Other air monitoring stations or programmes
None

RESEARCH

Project ..... : AEROCAN (the Canadian Sun-Photometer Network, not an acronym)

Purpose . . . . . : Understanding of aerosol optical characteristics measured using ground based, airborne and satellite sensors and the comparison of these characteristics with the predictions of physical and chemical models of aerosol dynamics at various nudging levels.
Start and end dates : 2000-2004
Agency(ies) . . . . : Churchill Northern Studies Centre, York University
PCA support . . . . : None

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

None. Wapusk is a new park and its management documents are still in development.

OTHER AIR ISSUES

None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type . . . . . : Nickel smelter
Location of source : Thompson, Manitoba
Frequency . . . . . : Continuous

See comments for other possible local air pollution sources

AIR ISSUE RELATED VALUES

Value . . . . . : Polar bears (and marine mammals in general)
Air issue(s) . . . . . : LRTAP, especially DDT and PCBs

Value . . . . . : Ice formation and western Hudson Bay polar bear population
Air issue(s) . . . . . : Climate change

Value . . . . . : Taiga-tundra ecotone with underlying permafrost
Air issue(s) . . . . . : Climate change

Value . . . . . : Ducks, geese, shorebirds, and terrestrial bird species nesting habitat
Air issue(s) . . . . . : Climate change

COMMENTS

The stressors in relation to air quality and climate change as indicated in the State of Protected Areas Report 1999 are still issues for Wapusk. Due to the nature of the tundra-taiga ecotone it is likely that global warming will have a significant impact on the Wapusk ecosystem and its components. Changes have been observed within the recent memory of long time residents in relation to length of seasons and changes to weather patterns. The

concerns identified in this questionnaire are supported in the Background Information to the Wapusk Ecological Integrity Statement and the report on Climate Change and Canada's National Park System.

Other air pollutant sources that may have an impact, but for which there is no supporting data, are:

Type ..... : Grain dust - Port of Churchill
Location of source : Churchill, Manitoba
Frequency ..... : July - October annually

Type ..... : Burning of waste
Location of source : Churchill municipal incinerator, Manitoba
Frequency ..... : Continuous

Type ..... : Diesel fumes - OmniTrax train yard
Location of source : Churchill, Manitoba
Frequency ..... : Continuous with higher density June to October

Type ..... : Tundra vehicle exhaust - staging area
Location of source : Cape Churchill, Manitoba
Frequency ..... : October - mid November

Type ..... : Aircraft exhaust
Location of source : Churchill, Manitoba
Frequency ..... : Significant during polar bear viewing season October - November

The following note was received MSC. "To my knowledge, there has been no air quality work that has been conducted in the Churchill region. I do not anticipate that there is any local air quality issue in the park or its adjacent environment that will lead to problems identified in the questionnaire. The only possibility that I might consider is long range transport of acidifying precursors from the smelter at Thompson, Manitoba. However, I have no knowledge of lake sensitivities in the park boundary and do not feel it would be useful for me to speculate on any potential for acidification without a lot more discussion. I would suggest you might bring this up with parks and suggest that we need to have further discussion with them. I would be very interested to know if Manitoba Conservation has had any concerns on this or any other air quality matter as well?"

WATERTON LAKES

Air issues contact. Cyndi Smith, Waterton Lakes National Park Field Unit
Person(s) completing the questionnaire. Cyndi Smith

PROGRAMMES

MONITORING

Weather stations

MSC name ..... : Akamina, #1150160
Location ..... : 49.1667, -114.3333; 49°10'00"N, 114°20'00"W; 1265.0 m asl
Type and duration : Automated; year-round
Properties recorded: T, P, WS, WD, snow pillow
Start date ..... : 1988; MSC reports this station as closing in 1912
Ownership ..... : MSC
PCA support .... : Licence of occupation

MSC name ..... : Akamina Pass, #3050070
PCA name ..... : Akamina Pass, #WLAKA
Location ..... : 49.0270, -114.0530; 49°01'37"N, 114°03'11"W; 1676.9 m asl
Type and duration : Automated, year-round
Properties recorded: T, P, RH, WS, WD, snow depth, snow pack temperature
Start date ..... : 1979-08-01
Ownership ..... : PCA
PCA support .... : All

MSC name ..... : Waterton Park Gate, #3056214
PCA name ..... : Crooked Creek, #WLCRK
Location ..... : 49.1333, -113.8000; 49°08'00"N, 113°48'00"W; 1296.0 m asl
Type and duration : Automated, year-round
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1988
Ownership ..... : MSC
PCA support .... : Licence of occupation

MSC name ..... : Waterton Red Rock, #3057242
PCA name ..... : Red Rock Canyon
Location ..... : 49.1333, -114.033; 49°08'00"N, 114°02'00"W; 1524.0 m asl
Type and duration : Automated; year-round
Properties recorded: T, P
Start date ..... : 1973-01-01
Ownership ..... : MSC
PCA support .... : Licence of occupation

Avalanche
PCA name ..... : Little Prairie
Location ..... : 49.0409, -114.0336; 49°02'27"N, 114°02'01"W; 1625.0 m asl
Type and duration : Manual, winter
Properties recorded: ???
Start date ..... : 2000-10-??
Ownership ..... : PCA
PCA support .... : All

Fire weather
PCA name ..... : Waterton Town Site, #WLWAT

Location ..... : 49.0600, -113.9000; 49°03'36"N, 113°54'00"W; 1280.0 m asl
Type and duration : Manual, Summer (April to October)
Properties recorded: T, P, RH, WS, WD
Start date ..... : 1942-??-??
Ownership ..... : PCA
PCA support .... : All

Other air monitoring stations or programmes
Name ..... : Acid Rain National Early Warning System
Properties recorded: Growth, crown structure and density, foliage chemistry, tree condition, disease and insect conditions.
Start date ..... : 1984
Agency(ies) .... : CFS
PCA support .... : Research authorization

RESEARCH
Project ..... : Surveys for forest insects, disease and pollution damage
Purpose ..... : To detect possible damage to forest trees, vegetation, and soils caused by air pollution.
Start and end dates : 1999-2004, plan to renew
Agency(ies) .... : CFS
PCA support .... : Research authorization

Project ..... : Persistent organic pollutants in osprey in the Rocky Mountains
Purpose ..... : To determine organochlorine concentrations in osprey eggs and young at selected nesting sites in subalpine areas of the Rocky Mountains, to evaluate whether such exposure may be harmful to the birds, and to relate organochlorine concentrations in eggs and nestling blood to concentrations in fish.
Start and end dates : Possibly 1999 to 2001, renewable year-to-year
Agency(ies) .... : Environment Canada
PCA support .... : Field logistics, egg collection in Banff, Jasper and Waterton Lakes

INTERPRETATION AND OUTREACH
None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Issue ..... : Burning of treated wood and other wastes at park trade waste pit
Value(s) impacted : ???
Value(s) at risk .. : Trace contamination of park soils and waters

Issue ..... : Smoke from prescribed and natural wild fire
Value(s) impacted : ???
Value(s) at risk .. : Visibility

Issue ..... : LRTAP - hazardous air pollutants, organochlorines
Value(s) impacted : ???
Value(s) at risk .. : Bioaccumulation in aquatic organisms

Issue ..... : Climate change
Value(s) impacted : ???
Value(s) at risk .. : High elevation plant tissues; change in latitudinal and altitudinal distribution of plants; increased erosion of park features.

OTHER AIR ISSUES

Issue ..... : Light pollution
Value(s) impacted : ???
Value(s) at risk .. : Sense of place and space

Issue ..... : Seasonal boat emissions
Value(s) impacted : ???
Value(s) at risk .. : Trace contamination of park waters; air quality; quality of visitor experience (noise, odours).

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Odour, hydrogen sulphide from Shell Canada processing plant
Location of source : 15 km NW
Frequency ..... : Very rare due to prevailing winds: once or twice monthly

Type ..... : Slash burning in Montana and British Columbia logging areas
Location of source : Variable: west and southwest of the park
Frequency ..... : 2 to 3 months per year, mostly in Fall

OTHER AIR ISSUE RELATED VALUES

Value ..... : Amphibian reproduction
Air issue(s) ..... : UV-B

Value ..... : Fire frequency and intensity
Air issue(s) ..... : Climate change (through effects on fuel buildup due to insect infestations, extended dry seasons, etc.).

Value ..... : Grizzly bear mortality
Air issue(s) ..... : Climate change (drought years result in berry crop failures and movement of bears onto adjacent ranch land)

COMMENTS

The park does not invest directly in air quality monitoring or evaluation of potential long range transport and deposition impacts. The park facilitates research by other federal and provincial agencies and by independent researchers.

From the 1998 draft Ecosystem Conservation Plan. "The strong environmental gradients from moist maritime-influenced subalpine forest to wind-blasted grassland, and the important role of evapotranspiration and exposure in shaping Waterton's vegetation diversity, makes this an area where changes in climatic trends may result in significant responses in landscape patterns. Many plant and animal species are at the extreme limits of their natural ranges and are likely to experience either range expansions or local extinctions in response to sustained changes in climate or landscape. Waterton is downwind in summer from sour gas processing facilities in Alberta, and in summer from the industrial and urban complexes in the Columbia River basin in Oregon and Washington. Long-range transport of air pollutants is already indicated by the concentration of toxaphene and other organochlorine contaminants that has been found in trout in subalpine lakes."

WOOD BUFFALO

Air issues contact. Mark Bradley, Southwest NWT Field Unit
Person(s) completing the questionnaire. Mark Bradley, Sharon Irwin and Clayton Szafron, Southwest NWT Field Unit

PROGRAMMES

MONITORING

Weather stations

PCA name ..... : Angus Tower, #WBAGU
Location ..... : 60.4368, -114.3083; 60°26'13"N, 114°18'30"W; 244.0 m asl
Type and duration : Fire tower
Properties recorded : T, P, RH, WS, WD, cloud cover
Start date ..... : 1976-05-13
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Bear Tower, #WBBEA
Location ..... : ???; 183.0 m asl
Type and duration : Manual, ???
No other information

PCA name ..... : Benchmark Creek, #WBBEN (Benchmark)
Location ..... : 59.7808, -112.0592; 59°46'51"N, 112°3'33"W; 121.0 m asl
Type and duration : Automatic, seasonal, typically mid April to late September
Properties recorded : T, P, RH, WS, WD, overwinter precipitation
Start date ..... : 1998-04-19
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Birch Mountain Tower, #WBBJN
Location ..... : 58.1127, -112.1567; 58°06'46"N, 112°09'24"W; 731.0 m asl
Type and duration : Fire tower

Properties recorded: T, P, RH, WS, WD, cloud cover
Start date ..... : 1976-06-02
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Buffalo Tower, #WBBUF (Little Buffalo Tower)
Location ..... : 59.6908, -113.0222; 59°41'27"N, 113°01'20"W; 305.0 m asl
Type and duration : Fire tower
Properties recorded: T, P, RH, WS, WD, cloud cover
Start date ..... : 1987-06-11
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Caribou Tower, #WBCXO
Location ..... : 59.5275, -114.5567; 59°31'39"N, 114°33'24"W; 914.0 m asl
Type and duration : Fire tower
Properties recorded: T, P, RH, WS, WD, cloud cover
Start date ..... : 1976-05-13
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Carlson Tower, #WBCIR
Type and duration : Manual, ???
No other information

PCA name ..... : Crowe Lookout, #WBCRO
Location ..... : 59.2697, -114.0010; 59°16'11"N, 114°00'04"W; 914.0 m asl
Type and duration : Fire tower
Properties recorded: T, P, RH, WS, WD, cloud cover
Start date ..... : 1984-05-18
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Davidson Lake Tower, #WBDLV
Location ..... : 58.9635, -113.2227; 58°57'49"N, 113°13'22"W; 244.0 m asl
Type and duration : Fire tower
Properties recorded: T, P, RH, WS, WD, cloud cover
Start date ..... : 1976-05-13
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

MSC name ..... : Garden River, #307KPFP
PCA name ..... : Garden River, #WBWGF
Location ..... : 58.7186, -113.8761; 58°43'07"N, 113°52'34"W; 240.8 m asl
Type and duration : Automatic, CS CR10, seasonal
Properties recorded: T, P(May-late September), RH, WS, WD

Start date ..... : 1994-04-05
Ownership ..... : PCA, MSC
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Klewi, #WBKLE
Location ..... : 60.5000, -113.7000; 60°30'00"N, 113°42'00"W; 150.0 m asl
Type and duration : Automatic, ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : All

PCA name ..... : Mile 99, #WBM99
Location ..... : 60.1400, -113.7450; 60°8'24"N, 113°44'42"W
Type and duration : Automatic, FWS-12, summer
Properties recorded: T, P (May-late September), RH, WS, WD
Start date ..... : 1998-04-18
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Parsons Lake Tower, #WBPZL (Parsons Lake)
Location ..... : 59.8972, -112.4802; 59°53'50"N, 112°28'49"W; 274.0 m asl
Type and duration : Fire tower
Properties recorded: T, P, RH, WS, WD, cloud cover
Start date ..... : 1976-05-13
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Penance Tower, #WBPNC
Location ..... : ??? 274.0 m asl
Type and duration : Manual, ???
No other information

PCA name ..... : Pincher Creek, #WBZPC
Location ..... : 49.3100, -114.0000; 49°18'36"N, 114°00'00"W; 1190.0 m asl
Type and duration : Manual, ???
No other information

MSC name ..... : Prairie River, #306A008
PCA name ..... : Prairie River
Location ..... : 58.6303, -111.6928; 58°37'49"N, 111°41'34"W; 211.8 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, WD, overwinter precipitation
Start date ..... : 1999
Ownership ..... : PCA
PCA support .... : Equipment purchase, periodic service

PCA name ..... : Rees Lookout, #WBREE
Location ..... : ??? 884.0 m asl
Type and duration : Manual, ???
No other information

Other air monitoring stations or programmes

Name ..... : Peregrine Falcon population monitoring
Location ..... : Wood Buffalo National Park and surrounding area
Properties recorded : Population size and productivity in relation to weather and toxic chemicals (long range transport of organic pesticides).
Start date ..... : 1971
Agency(ies) .... : PCA, CWS, Alberta Environment
PCA support .... : Field work, data storage, vehicle use, data analysis

Name ..... : Whooping Crane population monitoring
Location ..... : Wood Buffalo National Park and surrounding area
Properties recorded : Population size and productivity in relation to weather
Start date ..... : 1967
Agency(ies) .... : PCA, CWS
PCA support .... : Field work, data storage, vehicle use, data analysis

Name ..... : Plant phenology monitoring
Location ..... : Wood Buffalo National Park, Benchmark Creek
Properties recorded : Leaf out and flowering times for a number of plant species
Start date ..... : 2000
Agency(ies) .... : PCA, University of Alberta
PCA support .... : Field work, data storage, vehicle use

Name ..... : AVHRR monitoring
Location ..... : Wood Buffalo National Park
Properties recorded : Normalized difference vegetation index (photosynthetic rate)
Start date ..... : 1998
Agency(ies) .... : PCA
PCA support .... : Field work, data storage, vehicle use, data analysis

RESEARCH

Project ..... : Carbon cycling in the boreal forest
Purpose ..... : Carbon retention and climate relationships
Start and end dates : 2000-2002
Agency(ies) .... : University of Alberta
PCA support .... : Minimal logistical support

INTERPRETATION AND OUTREACH

None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK MANAGEMENT DOCUMENTS

Air issue ..... : LRTAP
Value(s) impacted : Peregrines still harbour low levels of DDT and PCBs
Value(s) at risk .. : Other predators at the top of the food chain

Air issue ..... : Regional air pollutants
Value(s) impacted : None
Value(s) at risk .. : Uncertain. As oil sands production expands, air quality may worsen

OTHER AIR ISSUES

Air issue ..... : Smoke during fire season
Value(s) impacted : Human health during bad fire years
Value(s) at risk .. : ???

Air issue ..... : Climate change
Value(s) impacted : None
Value(s) at risk .. : Human health should number and intensity of fires increase

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Burning of garbage
Location of source : Local dump
Frequency ..... : Constant until about two years ago, much less now

AIR ISSUE RELATED VALUES

Value ..... : Hydrological regime of the Peace-Athabasca Delta
Air issue(s) ..... : Climate change, decline in winter snow pack has reduced spring flooding

Value ..... : Hydrological regime of the Whooping Crane wetland
Air issue(s) ..... : Climate change, pond water levels and therefore chick survival

Value ..... : Peregrine Falcons and many other birds can lose their eggs or young
Air issue(s) ..... : Severe weather events

Value ..... : Bison disease: immigration of ungulate species like white tailed deer and elk could further complicate the situation by serving as reservoirs.
Air issue(s) ..... : Climate change

COMMENTS

WBNP's air quality is still relatively pristine. A previous study could find little evidence of nitrogen deposition, and air quality monitoring around the oil sands indicates that air pollution would be minimal in the park. We are a hot spot for climate change, however, and we have two COSEWIC listed species (whooping cranes and peregrine falcons) that could be adversely affected.

From the park's Ecological Integrity Statement (without citations)

"Long range transport of toxins
"WBNP's latitude makes it susceptible to the aerial transport of certain chemicals such as organochlorines and PCBs. Global air currents tend to pick up these pollutants near the equators and deposit them near the poles.

"Pollutants
"Goal: Air or water pollution should not compromise the ecological integrity of WBNP.
"Upstream Point Sources. The major upstream point sources of pollution are the petroleum industries (oil sands projects at Fort McMurray), pulp and paper (numerous mills in the Peace and Athabasca watersheds), and municipal effluents. There are also some defunct, unrestored Uranium mines on Lake Athabasca.
"Objective: pollutants from upstream point sources are minimized.
"Indicator: see indicators from water quality." Mark Bradley adds: "air quality should have been another indicator (oversight on my part)."
"Objective: toxins that are transported on air currents are minimized
"Indicator: see lichens and bryophytes indicator from Biodiversity section (objective 1.1.1) to monitor air pollution.
"Indicator: see Peregrine Falcons from Biodiversity section (objective 1.3.3) to monitor the effects of organic toxins.
"Indicator: opportunistically collect dead peregrine falcons and unhatched eggs to monitor organochlorine pesticides (objective 1.3.3)."

YOHO

Air issues contact. Terry Damm, Kootenay/Yoho/Lake Louise Field Unit
Person(s) completing the questionnaire. Terry Damm

PROGRAMMES

Monitoring
Weather stations

PCA name ..... : Bosworth
Location ..... : 51.4693, -116.3450; 51°28'10"N 116°20'42"W
Type and duration : Automatic, year-round
Properties recorded : T, RH, WS, WD
Start date ..... : 1993, moved and upgraded in 1997
Ownership ..... : PCA
PCA support .... : Maintenance, MSC supplies expertise to troubleshoot

PCA name ..... : Boulder Compound, #YOBOU (Boulder Creek)
Location ..... : 51.3612, -116.5216; 51°21'40"N, 116°31'18"W; 1249.7 m asl
Type and duration : Automatic, year-round
Properties recorded : T, P, RH, WS, WD
Start date ..... : Unknown, telemetry started in 1993, upgraded in 1997

Ownership ..... : PCA
PCA support .... : Maintenance, MSC supplies expertise to troubleshoot

PCA name ..... : Boulder Compound (EMAN)
Location ..... : 51.3612, -116.5216; 51°21'40"N, 116°31'18"W; 1249.7 m asl
Type and duration : Automatic, year-round, under canopy climate tower
Properties recorded: T, RH, photosynthetically active solar radiation, measured at several intervals up to 100' above ground.
Start date ..... : 1999
Ownership ..... : EMAN, PCA
PCA support .... : Operation

PCA name ..... : Wapta Lake, #YOWAP
Location ..... : 51.4833, -116.3333; 51°29'00"N, 116°20'00"W; 1700.0 m asl
Type and duration : Automatic, ???
Properties recorded: ???
Start date ..... : ???
Ownership ..... : PCA
PCA support .... : All

MSC name ..... : Yoho NP Emerald Lake, #117R00G
PCA name ..... : Yoho NP Emerald Lake
Location ..... : 51.4335, -116.5400; 51°26'00"N, 116°32'55"W; 1303.0 m asl
Type and duration : ???
Properties recorded: ???
Start date ..... : 1995-07-06
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Yoho NP O'Hara Lake, #117R00H
PCA name ..... : Yoho NP O'Hara Lake
Location ..... : 51.3500, -116.3333; 51°21'00"N, 116°20'00"W; 2027.0 m asl
Type and duration : ???
Properties recorded: ???
Start date ..... : 1987-12-21
Ownership ..... : MSC
PCA support .... : None

MSC name ..... : Yoho Park, #11790J1
PCA name ..... : Yoho Park, #YOWYL
Location ..... : 51.4428, -116.3440; 51°26'34"N, 116°20'39"W; 1615.4 m asl
Type and duration : Automatic, year-round
Properties recorded: T, P, RH, WS, snow depth
Start date ..... : 1992-10-14
Ownership ..... : PCA, MSC
PCA support .... : Maintenance, MSC supplies expertise to troubleshoot

Other air monitoring stations or programmes

Name ..... : Snow course water quality
Location ..... : ???
Properties recorded : ???
Start date ..... : 1960
Agency(ies) .... : British Columbia Ministry of Environment
PCA support .... : ???

Name ..... : Rainwater chemistry
Location ..... : ???
Properties recorded : Hydrocarbon sampler
Start date ..... : 1987
Agency(ies) .... : MSC, PCA
PCA support .... : ???

RESEARCH

None

INTERPRETATION AND OUTREACH

None

AIR ISSUES AND RELATED VALUES

AIR ISSUES RECOGNIZED IN CURRENT PARK DOCUMENTS

Issue ..... : Locomotive and truck emissions
Value(s) impacted : Not known
Values at risk ... : Air quality and visibility for visitors

Issue ..... : Smoke from campfires
Value(s) impacted : Not known
Values at risk ... : Air quality and visibility for visitors

OTHER AIR ISSUES

None

SIGNIFICANT LOCAL AIR POLLUTION SOURCES

Type ..... : Fumes from idling trains have been mentioned in park documents - significance uncertain.
Location of source : CP Rail and rail yards at Field, inside the park
Frequency ..... : Continual

Type ..... : Vehicle emissions
Location of source : Trans-Canada Highway trucking
Frequency ..... : Continual

Type ..... : Smoke from campfires
Location of source : Major campgrounds
Frequency ..... : Seven days per week, May to September

AIR ISSUE RELATED VALUES
None identified

COMMENTS

The 1988 Park Management Plan includes the following. "Section 3.9, Air Quality. The park contains a national railway and highway corridor, the community of Field, and a number of large campgrounds and lodges which affect air quality. The mountainous terrain often creates air inversions that concentrate pollutants in the Kicking Horse Valley. As facilities expand and visitor use increases the potential for damage to air quality also increases. ... Air quality guidelines will be developed in cooperation with (Environment Canada)."

APPENDIX 4

WEATHER STATIONS

This appendix is a print of a spreadsheet of all the weather stations within national park boundaries or operated in whole or part by Parks Canada staff or contractors, herein referred to collectively as Parks Canada weather stations, in 2001. For example, several parks maintain a weather station at their warden compound even though it is sited outside the gazetted park boundary. The information is blended from the returns of the questionnaire, the Environment Canada on-line catalogue of climate stations, an overlay of all Environment Canada weather and climate stations against park boundaries, and the Parks Canada Park Fire Information System. All stations listed in this appendix are referred to in Appendix 3, even though some stations were identified after the last questionnaire returns were received.

There were 166 Parks Canada weather stations, of which 83 are MSC stations and 77 fire weather information stations. Some are both, and 37 are neither, such as climate stations installed and run by universities in Arctic parks. The primary purposes of these stations are mainly for general operational support and ecosystem understanding (81), fire management (71), avalanche monitoring (9), water flow management (3), and landslide and glacier monitoring (1 each). Mingan Archipelago,

ANNEXE 4

STATIONS MÉTÉOROLOGIQUES

Cette annexe est l'imprimé des fichiers de toutes les stations météorologiques à l'intérieur des limites des parcs nationaux ou exploitées en tout ou en partie par le personnel de Parcs Canada ou des entrepreneurs, désignés collectivement comme les stations météorologiques de Parcs Canada en 2001. Par exemple, plusieurs parcs exploitent une station météorologique à la station des gardes de parc, même si celle-ci est située à l'extérieur des limites officielles du parc. Les informations sont la synthèse des résultats du questionnaire, du catalogue en ligne de stations climatologiques d'Environnement Canada, d'un transparent superposable de toutes les stations météorologiques et climatologiques d'Environnement Canada et des limites des parcs, et du système d'information sur les feux de Parcs Canada. Toutes les stations apparaissant dans cette annexe sont mentionnées à l'annexe 3, même si certaines stations ont été identifiées après la réception des derniers résultats des questionnaires.

Il y avait 166 stations météorologiques à Parcs Canada, dont 83 sont des stations de SMC et 77 des stations de météorologie dédiées à la gestion du feu. Certaines sont les deux, et 37 ne sont ni l'une ni l'autre, comme les stations climatologiques installées et exploitées par les universités dans les parcs de l'Arctique. Les principales raisons d'être de ces stations sont le soutien opérationnel général et la connaissance de l'écosystème (81), la gestion des feux (71), la surveillance des

Vuntut and Wapusk are the only parks without any weather station, either because they are well served by nearby stations (Mingan) or are new parks.

avalanches (9), la gestion des débits d'eau (3), et la surveillance des glissements de terrain et des glaciers (1 dans chaque cas). L'archipel de Mingan, Vuntut et Wapusk sont les seuls parcs sans aucune station météorologique, soit parce qu'ils sont bien desservis par des stations voisines (Mingan) ou parce qu'il s'agit de nouveaux parcs.

Field names

Park/site	Park name, including one national historic site
Default name	Name as supplied in 1) PFIS, 2) Air Issues Questionnaire 2001 or 3) MSC list
MSC name	Station name 1) as in MSC on-line climate station catalogue or 2) provided by MSC.
MSC#	As in MSC on-line climate station catalogue
PCA name	Name as supplied in 1) PFIS or 2) Air Issues Questionnaire 2001
PFIS#	PFIS number as in 1999
Latitude	Degrees to the fourth decimal place, North American datum unknown; park centroid for parks with no stations.
Longitude	Degrees to the fourth decimal place, with negative sign for west, North American datum unknown; park centroid for parks with no stations.
Elevation	In metres above sea level, North American datum unknown.
In/out	Inside or outside the park boundary according to 1) GIS overlay or 2) best guess
Start date	Oldest date of continuous records given by either MSC catalogue or Air Issues Questionnaire 2001
Purpose	Primary purpose or application
Period	Year-round or main season
Type	Automatic or manual

Noms des champs

Park/site	Nom du parc, incluant un lieu historique national
Default name	Nom donné par 1) le SIFP, 2) le Questionnaire sur les enjeux atmosphériques 2001, ou 3) la liste du SMC
MSC name	Nom de la station 1) comme dans le catalogue sur l'Internet du SMC ou 2) donné par le SMC
MSC#	Comme dans le catalogue sur l'Internet des stations climatiques du SMC
PCA name	Nom fourni par 1) le SIFP ou 2) le Questionnaire sur les enjeux atmosphériques 2001
PFIS#	Numéro dans le Système d'information sur les feux dans les parcs (SIFP) en 1999

Latitude	Degrés à la quatrième décimale, point de référence nord-américain inconnu; point médian des parcs sans stations
Longitude	Degrés à la quatrième décimale, avec signe négatif pour l'ouest, point de référence nord-américain inconnu; point médian des parcs sans stations
Elevation	Mètres au dessus du niveau de la mer, point de référence nord-américain inconnu
In/out	À l'intérieur ou à l'extérieur du parc grâce à un transparent superposable SIG ou 2) la meilleure estimation.
Start date	La date la plus ancienne des enregistrements continus donnée par le SMC ou le Questionnaire sur les enjeux atmosphériques 2001.
Purpose	Raison d'être ou application principale
Period	Toute l'année ou saison principale
Type	Automatique ou manuel

Park/site	Default name	MSC name	MSC#	PCA name
Aulavik	Green Cabin (WYF)	Thomsen River	2503886	Green Cabin (WYF)
Aulavik	Polar Bear Cabin (WSQ)	Aulavik National Park	2500440	Polar Bear Cabin (WSQ)
Auyuittuq	Pangnirtung	Pangnirtung	2403049	Pangnirtung
Auyuittuq	Summit Lake	N/A	N/A	Summit Lake
Banff	(AE) Bow Summit	(AE) Bow Summit	3050PFP	N/A
Banff	Banff Townsite	Banff CS	3050519	Banff Townsite
Banff	Bow Summit, Highway 93 N	Bow Summit (PC)	305A002	Bow Summit, Highway 93 N
Banff	Castle Mountain Village	Castle Mountain Village	3051424	N/A
Banff	Cuthead Lake	Cuthead Lake	3051R51	N/A
Banff	False St. Nicholas Peak, Wapta Icefields	False Nicholas	3052603	False St. Nicholas Peak, Wapta Icefields
Banff	Lake Louise Warden Office	Lake Louise	3053760	Lake Louise Warden Office
Banff	Saskatchewan Crossing	Sask River Crossing 2	3055754	Saskatchewan Crossing
Banff	Scotch Camp	Scotch Camp	3055768	N/A
Banff	Skoki	Skoki	3055976	N/A
Banff	Spray	N/A	N/A	Spray
Banff	Sundee, Albert	N/A	N/A	Sundee, Albert
Banff	Sunshine Ski Area, Lookout Mountain	Lookout	305A003	Sunshine Ski Area, Lookout Mountain
Banff	Sunshine Ski Area, Village area	Goat's Eye	3052838	Sunshine Ski Area, Village area
Banff	Temple	Temple	3056LPA	N/A
Banff	Ya Ha Tinda Ranch	N/A	N/A	Ya Ha Tinda Ranch
Bruce Peninsula	Cyprus	Cyprus Lake CS	6121940	Cyprus
Cape Breton Highlands	Cheticamp	Cheticamp	8200825	Cheticamp
Cape Breton Highlands	Cheticamp CS	Cheticamp CS	8200827	N/A
Cape Breton Highlands	Grand Etang	Grand Etang	8201969	Grand Etang
Cape Breton Highlands	Ingonish Beach	Ingonish Beach CS	8202502	Ingonish Beach
Cape Breton Highlands	North Mountain	North Mountain CS	8204161	North Mountain
Cape Breton Highlands	North Mountain (2)	N/A	N/A	North Mountain (2)
Elk Island	Elk Island	Elk Island National Park	3012275	Elk Island
Fathom Five	Cove Island	Cove Island (AUT)	61219J2	Cove Island
Fonlion	Operations centre	N/A	N/A	Operations centre
Fortress of Louisbourg	Fortress of Louisbourg	N/A	N/A	Fortress of Louisbourg
Fundy	Alma manual	Alma	8100200	Alma manual
Fundy	Fundy Alma	Fundy Park (Alma) CS	8101746	Fundy Alma
Fundy	Wolf	Wolfe Lake CS	8105597	Wolf
Georgian Bay Islands	Beausoleil Island	Beausoleil	6110617	Beausoleil Island
Glacier	Beaver Valley East Gate	N/A	N/A	Beaver Valley East Gate
Glacier	Beaver Valley Upper Site	N/A	N/A	Beaver Valley Upper Site
Glacier	Fidelity	Glacier NP Mt Fidelity	117CA90	Fidelity
Glacier	Fidelity (BC Hydro)	N/A	N/A	Fidelity (BC Hydro)
Glacier	Fidelity Mountain	N/A	N/A	Fidelity Mountain
Glacier	Glacier Station	N/A	N/A	Glacier Station
Glacier	Glacier Station (BC Hydro)	N/A	N/A	Glacier Station (BC Hydro)
Glacier	Heather Hill	N/A	N/A	Heather Hill
Glacier	Hermit	N/A	N/A	Hermit
Glacier	Lookout	N/A	N/A	Lookout
Glacier	MacDWSh	N/A	N/A	MacDWSh
Glacier	Mount Abbott	N/A	N/A	Mount Abbott
Glacier	Mountain Creek	N/A	N/A	Mountain Creek
Glacier	Rockfall	N/A	N/A	Rockfall
Glacier	Rogers Pass	Glacier NP Rogers Pass	1173191	Rogers Pass
Glacier	Roundhill	N/A	N/A	Roundhill
Grasslands	East Block (McGowan's)	N/A	N/A	East Block (McGowan's)
Grasslands	West Block	N/A	N/A	West Block
Gros Morne	Big Level	N/A	N/A	Big Level
Gros Morne	Rocky Harbour	Rocky Harbour CS	8403097	Rocky Harbour
Gwaii Haanas	Cape St James CS	Cape St James CS	1051351	N/A
Ivvavik	Komakuk Beach	Komakuk Beach	2100682	N/A
Ivvavik	Margaret Lake (WZR)	Margaret Lake	2100697	Margaret Lake (WZR)
Ivvavik	Sheep Creek (WOI)	Ivvavik Nat. Park	2100660	Sheep Creek (WOI)
Jasper	Devona	Devona	3052069	Devona
Jasper	Jasper East Gate	Jasper East Gate	3063523	N/A
Jasper	Jasper Warden Office	Jasper Warden	3053536	Jasper Warden Office
Jasper	Jasper West Gate	Jasper West Gate	3053538	N/A
Jasper	Marmot Basin	Marmot Basin	305421B	N/A
Jasper	Marmot Triple	Marmot Triple	3054215	N/A
Jasper	Parker Ridge	Parker Ridge	3054998	N/A
Jasper	Parker Ridge Lower	N/A	N/A	Parker Ridge Lower
Jasper	Parker Ridge Upper	Upr Parker Ridge	3056657	Parker Ridge Upper
Jasper	Sunwapta	Sunwapta	3056272	Sunwapta
Jasper	Upr Parker Ridge	Upr Parker Ridge	3056657	N/A
Jasper	Willow Creek	Willow Creek	306GE70	Willow Creek
Kejimkujik	Kejimkujik National Park Weather Station	Kejimkujik 1	8202592	Kejimkujik National Park Weather Station
Kluane	Haines Junction Parks Canada Operation Centre	Haines Junction	2100630	Haines Junction Parks Canada Operation Centre
Kluane	Ecological Monitoring Program Donjek	N/A	N/A	Ecological Monitoring Program Donjek
Kluane	Ecological Monitoring Program Quill	N/A	N/A	Ecological Monitoring Program Quill
Kluane	Ecological Monitoring Program Silver	N/A	N/A	Ecological Monitoring Program Silver
Kluane	Ecological Monitoring Program St Elias Transect	N/A	N/A	Ecological Monitoring Program St Elias Transect
Kluane	Ecological Monitoring Program Suphur	N/A	N/A	Ecological Monitoring Program Suphur
Kootenay	Kootenay Administration	N/A	N/A	Kootenay Administration
Kootenay	Kootenay Crossing Warden Station	Kootenay NP KTNY CRSG	1154400	Kootenay Crossing Warden Station
Kootenay	Kootenay NP West Gate	Kootenay NP West Gate	1154410	Kootenay NP West Gate
Kootenay	McLeod Meadows	N/A	N/A	McLeod Meadows
Kootenay	Swede Creek	N/A	N/A	Swede Creek

Park/site	PFIS#	Latitude	Longitude	Elevation	In/Out	Start date	Purpose	Period	Type
Aulavik	N/A	73.2303	-119.5367	37.0	In	1996/06/27	General	Year-round	Automatic
Aulavik	N/A	74.1417	-119.9903	32.0	In	1996/06/26	General	Year-round	Automatic
Auyuittuq	N/A	66.1500	-65.7167	22.6	Out	1983/04/15	General	Year-round	Automatic
Auyuittuq	N/A	66.6135	-65.2243	N/A	In	1998-??-??	General	Year-round	Automatic
Banff	N/A	51.7000	-116.4670	2080.0	In	1997/10/21	General	Unknown	Unknown
Banff	BAWZG	51.1900	-115.5500	1396.9	In	1905/06/19	Fire	Year-round	Automatic
Banff	N/A	51.7900	-116.5600	2011.7	In	1991-??-??	General	Year-round	Automatic
Banff	N/A	51.2667	-115.9170	1524.0	In	1983/05/01	General	Unknown	Unknown
Banff	N/A	51.4500	-115.7670	2179.0	In	1981/09/01	General	Unknown	Unknown
Banff	N/A	51.6255	-116.4669	2926.1	In	1991-??-??	General	Year-round	Automatic
Banff	BALKL	51.4300	-116.1900	1554.5	In	1915/01/01	Fire	Year-round	Automatic
Banff	BASAX	51.9678	-116.7117	1402.1	In	1976/11/01	Fire	Year-round	Automatic
Banff	N/A	51.6667	-115.8000	1737.4	In	1981/08/01	General	Unknown	Unknown
Banff	N/A	51.5333	-116.0500	2040.0	In	1981/09/01	General	Unknown	Unknown
Banff	SPRAY	N/A	N/A	N/A	N/A	N/A	Fire	Unknown	Unknown
Banff	BAWAV	51.4600	-114.4100	1115.0	Out	N/A	Fire	Unknown	Unknown
Banff	N/A	51.0743	-115.7582	2621.0	In	1984-??-??	General	Year-round	Unknown
Banff	N/A	51.0781	-115.7824	2200.0	In	1984-??-??	General	Year-round	Unknown
Banff	N/A	51.4333	-116.1500	1891.0	In	1989/09/26	General	Unknown	Unknown
Banff	BAYAH	51.7464	-115.5665	1700.0	Out	N/A	General	Unknown	Unknown
Bruce Peninsula	BPCYP	45.2333	-81.5333	190.0	In	1972-??-??	Fire	Year-round	Automatic
Cape Breton Highlands	N/A	46.6447	-60.9470	11.0	In	1956/02/01	General	Year-round	Automatic
Cape Breton Highlands	N/A	46.6500	-60.9500	44.0	In	1998/05/07	General	Unknown	Automatic
Cape Breton Highlands	CBCHE	46.5500	-61.0333	12.8	In	1991/06/04	Fire	Year-round	Automatic
Cape Breton Highlands	CBING	46.6633	-60.4058	8.0	In	1947-??-??	Fire	Year-round	Automatic
Cape Breton Highlands	CBNOR	46.8178	-60.6720	439.4	In	1995-??-??	Fire	Year-round	Automatic
Cape Breton Highlands	NM-99	46.8200	-60.6660	N/A	In	N/A	Fire	Unknown	Unknown
Elk Island	EIWFE	53.6833	-112.8670	716.2	In	1981/12/01	Fire	Year-round	Automatic
Fathom Five	N/A	45.3333	-81.7333	180.7	In	1965-??-??	General	Year-round	Automatic
Fortilon	N/A	48.8569	-64.3744	N/A	In	1996-??-??	Fire	Summer	Automatic
Fortress of Louisbourg	FOLHS	45.9078	-60.0097	91.4	In	1962-??-??	Fire	Year-round	Manual
Fundy	N/A	45.6000	-64.9500	42.7	In	1950/02/01	General	Year-round	Manual
Fundy	FUALM	45.6000	-64.9500	42.7	In	1993/07/01	Fire	Year-round	Automatic
Fundy	FUWFD	45.6667	-65.1500	304.8	In	1993/07/01	Fire	Year-round	Automatic
Georgian Bay Islands	GBWPB	44.8500	-79.8667	183.0	In	1974/01/10	Fire	Year-round	Automatic
Glacier	GLLBE	51.4160	-117.4600	853.0	In	N/A	Fire	Summer	Automatic
Glacier	GLUBE	51.3083	-117.3728	1524.0	In	N/A	Fire	Summer	Automatic
Glacier	N/A	51.2364	-117.7180	1874.5	In	1961-??-??	Avalanche	Year-round	Automatic
Glacier	N/A	51.2368	-117.7001	N/A	In	N/A	Hydro	Year-round	Automatic
Glacier	GLFID	51.0235	-118.2055	1219.0	In	N/A	Fire	Summer	Automatic
Glacier	N/A	51.2700	-117.5086	N/A	In	1902-??-??	Avalanche	Year-round	Manual
Glacier	N/A	51.2700	-117.5086	N/A	In	N/A	Hydro	Year-round	Automatic
Glacier	N/A	51.4460	-117.4754	N/A	In	2000-??-??	Avalanche	Winter	Automatic
Glacier	N/A	51.3291	-117.5222	N/A	In	1977-??-??	Avalanche	Winter	Automatic
Glacier	N/A	51.2316	-117.4508	N/A	In	1998-??-??	Glacier	Year-round	Automatic
Glacier	N/A	51.3073	-117.5014	N/A	In	1961-??-??	Avalanche	Winter	Automatic
Glacier	N/A	51.2543	-117.5104	N/A	In	1961-??-??	Avalanche	Winter	Manual
Glacier	GLMCK	51.4569	-117.5264	1560.0	In	1998-??-??	Fire	Summer	Automatic
Glacier	N/A	51.4323	-117.4369	N/A	In	1999-??-??	Landslide	Year-round	Automatic
Glacier	GLRGR	51.3024	-117.5155	1322.8	In	1965/06/01	Avalanche	Year-round	Automatic
Glacier	N/A	51.2350	-117.7085	N/A	In	1963-??-??	Avalanche	Winter	Automatic
Grasslands	N/A	49.0679	-106.5194	N/A	In	1998-11-??	General	Year-round	Automatic
Grasslands	N/A	49.1167	-107.9667	N/A	In	1994-05-??	General	Year-round	Automatic
Gros Morne	N/A	49.7000	-57.7667	N/A	In	1993-??-??	General	Year-round	Automatic
Gros Morne	N/A	49.5750	-57.8750	67.7	Out	1972-??-??	General	Year-round	Automatic
Gwaii Haanas	N/A	51.9358	-131.0160	91.9	In	1992/09/01	General	Year-round	Automatic
Ivvavik	N/A	69.6199	-140.1970	13.2	Out	1992/06/10	General	Year-round	Automatic
Ivvavik	N/A	68.8006	-140.9480	524.5	In	1997/06/09	General	Year-round	Automatic
Ivvavik	N/A	69.1644	-140.1500	301.8	In	1995/06/11	General	Year-round	Automatic
Jasper	JADE2	53.1700	-118.0300	1403.6	In	1997-??-??	Fire	Year-round	Automatic
Jasper	N/A	53.2333	-117.8170	1002.8	In	1971/01/01	General	Unknown	Unknown
Jasper	JAWJW	52.9500	-118.0100	1020.0	In	1988/11/25	Fire	Year-round	Automatic
Jasper	N/A	52.8667	-118.3830	1127.8	In	1974/07/01	General	Unknown	Unknown
Jasper	N/A	52.6833	-118.1000	2072.0	In	1983/09/01	General	Unknown	Unknown
Jasper	N/A	52.7000	-118.1170	2290.0	In	1998/10/31	General	Unknown	Unknown
Jasper	N/A	52.2000	-117.1333	2023.0	In	1974/12/01	General	Winter	Unknown
Jasper	JAPAL	52.1900	-117.0100	N/A	In	1999-??-??	Fire	Year-round	Automatic
Jasper	JAPAU	52.0100	-117.0900	2317.0	In	1998/10/31	Fire	Year-round	Automatic
Jasper	JASU2	52.4500	-117.4400	1554.5	In	1979/09/01	Fire	Year-round	Automatic
Jasper	N/A	52.1833	-117.0830	2316.5	In	1998/10/31	General	Unknown	Unknown
Jasper	JAWWO	53.3900	-118.3500	1402.1	In	1993/07/01	Fire	Year-round	Automatic
Kejimkujik	KEDLY	44.4367	-65.1737	126.5	In	1966-??-??	Fire	Year-round	Automatic
Kluane	KLWHT	60.7500	-137.5830	599.0	Out	1983/05/01	Fire	Year-round	Automatic
Kluane	N/A	N/A	N/A	N/A	Out	2001-??-??	General	Year-round	Automatic
Kluane	N/A	N/A	N/A	N/A	In	2001-??-??	General	Year-round	Automatic
Kluane	N/A	N/A	N/A	N/A	Out	2001-??-??	General	Year-round	Automatic
Kluane	N/A	N/A	N/A	N/A	In	2001-??-??	General	Year-round	Automatic
Kluane	N/A	N/A	N/A	N/A	Out	2001-??-??	General	Year-round	Automatic
Kootenay	KOADM	50.5833	-116.0833	900.0	In	1995-??-??	Fire	Year-round	Automatic
Kootenay	N/A	50.8833	-116.0510	1170.4	In	1965/06/01	General	Year-round	Manual
Kootenay	N/A	50.6303	-116.0620	899.2	In	1968/11/01	General	Year-round	Manual
Kootenay	KOMCL	50.7703	-115.9506	1158.2	In	1997-??-??	Fire	Year-round	Automatic
Kootenay	KOLOO	50.6725	-115.8919	1402.1	In	1997-??-??	Fire	Year-round	Automatic

Park/site	Default name	MSC name	MSC#	PCA name
Kootenay	Vermillion (Lower)	N/A	N/A	Vermillion (Lower)
Kootenay	Vermillion (Upper)	N/A	N/A	Vermillion (Upper)
Kootenay	Vermillion Crossing	N/A	N/A	Vermillion Crossing
Kouchibouguac	Kouchibouguac National Park	Kouchibouguac CS	8102328	Kouchibouguac National Park
La Mauricie	La Mauricie	N/A	N/A	La Mauricie
La Mauricie	La Mauricie Park	N/A	N/A	La Mauricie Park
Mount Revelstoke	Balsam Lake (BC Hydro)	N/A	N/A	Balsam Lake (BC Hydro)
Mount Revelstoke	Revelstoke One Mile	N/A	N/A	Revelstoke One Mile
Nahanni	Deadmen Valley	Deadmen Valley	22010H0	Deadmen Valley
Nahanni	Rabbitkettle Lake	Rabbit Kettle	2203342	Rabbitkettle Lake
Nahanni	Virginia Falls	Virginia Falls	2203943	Virginia Falls
Nahanni	Yohin	Yohin	2204300	Yohin
Pacific Rim	Cape Beale Light	Cape Beale Light	1031316	Cape Beale Light
Pacific Rim	Carmanah Point	Carmanah Point	1031402	Carmanah Point
Pacific Rim	Nitinat Lake	Nitinat Lake (AUT)	103EFJ0	Nitinat Lake
Pacific Rim	Pachena Point	Pachena Point	1035940	Pachena Point
Pacific Rim	Tofino Airport	Tofino A	1038205	Tofino Airport
Point Pelee	Point Pelee	Point Pelee CS	613P001	Point Pelee
Prince Albert	Bear Trap/Waskesiu	Waskesiu Lake	4068559	Bear Trap/Waskesiu
Prince Albert	Brvr	Big River	4060620	Brvr
Prince Albert	Candle Lake	N/A	N/A	Candle Lake
Prince Albert	Cookson	N/A	N/A	Cookson
Prince Albert	Delworth/Thunder Mountain	N/A	N/A	Delworth/Thunder Mountain
Prince Albert	Elaine Lake	N/A	N/A	Elaine Lake
Prince Albert	Molonosa	N/A	N/A	Molonosa
Prince Albert	Rabbit Hill	N/A	N/A	Rabbit Hill
Prince Albert	Wabno	N/A	N/A	Wabno
Prince Albert	Wask	N/A	N/A	Wask
Prince Edward Island	Stanhope2	Stanhope	8300590	Stanhope2
Pukaskwa	Hattie Cove	Pukaskwa (AUT)	6046767	Hattie Cove
Pukaskwa	Otter Cove	N/A	N/A	Otter Cove
Pukaskwa	Pukaskwa Natl Park	Pukaskwa Natl Park	6046770	N/A
Pukaskwa	Soldier Mountain	N/A	N/A	Soldier Mountain
Quttinirpaaq	Fort Conger	N/A	N/A	Fort Conger
Quttinirpaaq	Lake Hazen	N/A	N/A	Lake Hazen
Quttinirpaaq	Tanquary Fiord	N/A	N/A	Tanquary Fiord
Quttinirpaaq	Ward Hunt	N/A	N/A	Ward Hunt
Riding Mountain	Deep Lake	N/A	N/A	Deep Lake
Riding Mountain	Kippens Mill	N/A	N/A	Kippens Mill
Riding Mountain	Wasagaming AES	Wasagaming	5013117	Wasagaming AES
Saguenay Saint-Laurent	Cap Rouge	Cap Rouge	7041166	Cap Rouge
Saguenay Saint-Laurent	Ile Rouge	Ile Rouge	7043BP9	Ile Rouge
Saguenay Saint-Laurent	Pointe à Claveau	Pointe Claveau	704607C	Pointe à Claveau
Saguenay Saint-Laurent	Pointe de l'Islet	N/A	N/A	Pointe de l'Islet
Saint Lawrence	Grenadier Island Slinp	Grenadier Island	6103024	Grenadier Island Slinp
Sirmilik	Bylot 1	N/A	N/A	Bylot 1
Sirmilik	Bylot 2	N/A	N/A	Bylot 2
Sirmilik	Bylot 3	N/A	N/A	Bylot 3
Terra Nova	Bluehill West	N/A	N/A	Bluehill West
Terra Nova	Park Harbor	N/A	N/A	Park Harbor
Terra Nova	TNPCS (Headquarters)	Terra Nova Nat Park CS	8403851	TNPCS (Headquarters)
Tuktut Nogait	Melville Hills (XTN)	Tuktut Nogait	2203918	Melville Hills (XTN)
Tuktut Nogait	Qavvik Lake (XQA)	Qavvik Lake	2203341	Qavvik Lake (XQA)
Waterton Lakes	Akamina	Akamina	1150160	N/A
Waterton Lakes	Akamina Pass	Akamina Pass	3050070	Akamina Pass
Waterton Lakes	Crooked Creek	Waterton Park Gate	3056214	Crooked Creek
Waterton Lakes	Little Prairie	N/A	N/A	Little Prairie
Waterton Lakes	Red Rock Canyon	Waterton Red Rock	3057242	Red Rock Canyon
Waterton Lakes	Waterton Town site	N/A	N/A	Waterton Town site
Wood Buffalo	Angus Tower	N/A	N/A	Angus Tower
Wood Buffalo	Bear Tower	N/A	N/A	Bear Tower
Wood Buffalo	Benchmark Creek	N/A	N/A	Benchmark Creek
Wood Buffalo	Birch Mountain Tower	N/A	N/A	Birch Mountain Tower
Wood Buffalo	Buffalo Tower	N/A	N/A	Buffalo Tower
Wood Buffalo	Caribou Tower	N/A	N/A	Caribou Tower
Wood Buffalo	Carlson Tower	N/A	N/A	Carlson Tower
Wood Buffalo	Crowe Lookout	N/A	N/A	Crowe Lookout
Wood Buffalo	Davidson Lake Tower	N/A	N/A	Davidson Lake Tower
Wood Buffalo	Garden River	Garden River	307KPFP	Garden River
Wood Buffalo	Klewi	N/A	N/A	Klewi
Wood Buffalo	Mile 99	N/A	N/A	Mile 99
Wood Buffalo	Parsons Lake Tower	N/A	N/A	Parsons Lake Tower
Wood Buffalo	Penance Tower	N/A	N/A	Penance Tower
Wood Buffalo	Pincher Creek	N/A	N/A	Pincher Creek
Wood Buffalo	Prairie River	Prairie River	306A008	Prairie River
Wood Buffalo	Rees Lookout	N/A	N/A	Rees Lookout
Yoho	Bosworth	N/A	N/A	Bosworth
Yoho	Boulder Compound	N/A	N/A	Boulder Compound
Yoho	Boulder Compound (EMAN)	N/A	N/A	Boulder Compound (EMAN)
Yoho	Wapta Lake	N/A	N/A	Wapta Lake
Yoho	Yoho NP Emerald Lake	Yoho NP Emerald Lake	117R00G	Yoho NP Emerald Lake
Yoho	Yoho NP O'Hara Lake	Yoho NP O'Hara Lake	117R00H	Yoho NP O'Hara Lake
Yoho	Yoho Park	Yoho Park	11790J1	Yoho Park

Park/site	PFIS#	Latitude	Longitude	Elevation	In/out Start date	Purpose	Period	Type
Kootenay	N/A	50.9836	-115.9814	N/A	In 1997-??-??	General	Year-round	Automatic
Kootenay	N/A	50.9893	-115.9898	N/A	N/A 197?-??-??	General	Year-round	Automatic
Kootenay	KOVER	50.9661	-115.9447	1249.7	In 1997-??-??	Fire	Year-round	Automatic
Kouchibouguac	KGKOU	46.7544	-65.0036	34.0	In 1969-??-??	Fire	Year-round	Automatic
La Mauricie	N/A	46.7678	-73.0064	390.0	In 1999-??-??	General	Year-round	Semi-aut
La Mauricie	LMPLU	46.7372	-73.0500	240.0	In 1993-??-??	Fire	Year-round	Semi-aut
Mount Revelstoke	N/A	N/A	N/A	N/A	In N/A	Hydro	Year-round	Automatic
Mount Revelstoke	REMO1	51.0235	-118.2055	554.0	In N/A	Fire	Summer	Automatic
Nahanni	N/A	61.2500	-124.4667	283.0	In 2001/07/25	General	Year-round	Automatic
Nahanni	WQF	61.9631	-127.2090	618.0	In 1995/09/15	Fire	Year-round	Automatic
Nahanni	N/A	61.6167	-125.7833	609.6	In 1973/08/01	General	Year-round	Automatic
Nahanni	N/A	61.2333	-123.7333	204.0	In 2001/07/27	General	Year-round	Automatic
Pacific Rim	N/A	48.7833	-125.2170	25.9	In 1968/02/01	General	Year-round	Unknown
Pacific Rim	N/A	48.6117	-124.7510	38.1	In 1968/03/01	General	Unknown	Unknown
Pacific Rim	N/A	48.6667	-124.8330	36.4	In 1987/06/11	General	Year-round	Automatic
Pacific Rim	N/A	48.7167	-125.1000	37.0	In 11/1/24	General	Unknown	Unknown
Pacific Rim	PRYAZ	49.0806	-125.7780	24.1	In 1942/07/01	General	Winter	Manual
Point Pelee	N/A	41.9487	-82.5191	176.8	In 1966-??-??	General	Year-round	Automatic
Prince Albert	PAWLV	53.9167	-106.0806	569.4	In 1934-??-??	General	Year-round	Automatic
Prince Albert	PABRV	53.8331	-107.0306	502.9	Out 1956/10/01	Fire	Summer	Automatic
Prince Albert	PACAN	53.7583	-105.2167	N/A	Out 1989-??-??	Fire	Summer	Automatic
Prince Albert	PACOK	53.6667	-106.5000	525.8	In 1934-??-??	General	Year-round	Automatic
Prince Albert	PA3	55.0000	-106.0000	449.9	In N/A	Fire	Unknown	Unknown
Prince Albert	N/A	53.0000	-106.0833	N/A	Out 1989-??-??	Fire	Summer	Automatic
Prince Albert	PAMOL	54.4476	-105.5217	499.9	Out 1989-??-??	Fire	Summer	Automatic
Prince Albert	PARAB	54.3297	-107.1806	579.1	Out 1989-??-??	Fire	Summer	Automatic
Prince Albert	PAWAB	54.3738	-106.3665	571.5	In N/A	Fire	Unknown	Unknown
Prince Albert	PAWAS	54.8816	-106.1290	-106.1	In N/A	Fire	Unknown	Unknown
Prince Edward Island	STN1	46.4164	-63.0831	3.0	In 1961/06/01	General	Year-round	Automatic
Pukaskwa	PUWCJ	48.5883	-86.2947	207.6	In 1993/01/04	Fire	Year-round	Automatic
Pukaskwa	PUOTT	48.0916	-85.9647	N/A	In 1993-05-??	Fire	Year-round	Automatic
Pukaskwa	N/A	48.6000	-86.3000	192.0	Out 1983/07/01	General	Unknown	Manual
Pukaskwa	PUSOL	48.3902	-85.7558	N/A	In 1993-05-??	Fire	Year-round	Automatic
Quttinirpaaq	N/A	81.7523	-64.8320	N/A	In 1988-??-??	General	Year-round	Automatic
Quttinirpaaq	N/A	81.8248	-71.3346	N/A	In 1988-??-??	General	Year-round	Automatic
Quttinirpaaq	N/A	81.4040	-76.8750	N/A	In 1988-??-??	General	Year-round	Automatic
Quttinirpaaq	N/A	83.0933	-74.1629	N/A	In 1996-??-??	General	Year-round	Automatic
Riding Mountain	RMDEP	50.5144	-100.5030	677.0	In 1986-??-??	Fire	Summer	Automatic
Riding Mountain	RMKIP	50.5220	-100.0226	726.0	In 1986-??-??	Fire	Summer	Automatic
Riding Mountain	N/A	50.3921	-99.5625	627.4	In 1966/03/01	General	Year-round	Automatic
Saguenay Saint-Laurent	N/A	48.3747	-70.5354	7.0	In 1993/12/14	General	Year-round	Automatic
Saguenay Saint-Laurent	N/A	48.0688	-69.5555	5.9	In 1984/08/24	General	Year-round	Automatic
Saguenay Saint-Laurent	N/A	48.2604	-70.1145	4.0	In 1993/12/14	General	Year-round	Automatic
Saguenay Saint-Laurent	N/A	48.1347	-69.7165	7.0	In 1993-??-??	General	Year-round	Automatic
Saint Lawrence	FIRE	44.4177	-75.8529	82.0	In 1992/09/10	Fire	Year-round	Automatic
Sirmilik	N/A	73.1500	-80.0050	20.0	In 1992-??-??	General	Year-round	Automatic
Sirmilik	N/A	73.1550	-79.9537	20.0	In 1994-??-??	General	Year-round	Automatic
Sirmilik	N/A	73.1417	-79.9017	370.0	In 2001-??-??	General	Year-round	Automatic
Terra Nova	N/A	48.5903	-53.9897	N/A	In 1999-09-??	General	Unknown	Automatic
Terra Nova	N/A	48.5286	-53.8058	N/A	In 2001/08/01	General	Unknown	Automatic
Terra Nova	TNPCS	48.5569	-53.9744	106.7	In 1962/01/01	General	Year-round	Automatic
Tuktut Nogait	N/A	69.1928	-122.3539	551.6	In 1998/07/25	General	Year-round	Automatic
Tuktut Nogait	N/A	68.2256	-122.0206	530.0	In 1999/07/07	General	Year-round	Automatic
Waterton Lakes	N/A	49.1667	-114.3333	1265.0	In 1988-??-??	General	Year-round	Automatic
Waterton Lakes	WLAKA	49.0270	-114.0530	1676.0	In 1979/08/01	Fire	Year-round	Automatic
Waterton Lakes	WLCRK	49.1333	-113.8000	1296.0	In 1988-??-??	Fire	Year-round	Automatic
Waterton Lakes	N/A	49.0409	-114.0336	1625.0	In 2000/10-??	Avalanche	Winter	Manual
Waterton Lakes	N/A	49.1333	-114.0330	1524.0	In 1973/01/01	General	Year-round	Automatic
Waterton Lakes	WLWAT	49.0600	-113.9000	1280.0	In 1942-??-??	Fire	Summer	Manual
Wood Buffalo	WBAGU	60.4368	-114.3083	244.0	In 1976/05/13	Fire	Unknown	Unknown
Wood Buffalo	WBBEA	N/A	N/A	183.0	In N/A	Fire	Unknown	Manual
Wood Buffalo	WBBEN	59.7808	-112.0592	121.0	In 1998/04/19	Fire	Summer	Automatic
Wood Buffalo	WBBJN	58.1127	-112.1567	731.0	In 1976/06/02	Fire	Unknown	Unknown
Wood Buffalo	WBBUF	59.6908	-113.0222	305.0	In 1987/06/11	Fire	Unknown	Unknown
Wood Buffalo	WBCXO	56.5275	-114.5567	914.0	In 1976/05/13	Fire	Unknown	Unknown
Wood Buffalo	WBCIR	N/A	N/A	N/A	In N/A	Fire	Unknown	Manual
Wood Buffalo	WBCRO	59.2697	-114.0010	914.0	In 1984/05/18	Fire	Unknown	Unknown
Wood Buffalo	WBDLV	58.9535	-113.2227	244.0	In 1976/05/13	Fire	Unknown	Unknown
Wood Buffalo	WBWGF	58.7186	-113.8761	240.8	In 1994/04/05	Fire	Summer	Automatic
Wood Buffalo	WBKLE	60.5000	-113.7000	150.0	In N/A	Fire	Unknown	Automatic
Wood Buffalo	WBM99	60.1400	-113.7450	N/A	In 1998/04/18	Fire	Summer	Automatic
Wood Buffalo	WBPZL	59.8972	-112.4802	274.0	In 1976/05/13	Fire	Unknown	Unknown
Wood Buffalo	WBPNC	N/A	N/A	274.0	In N/A	Fire	Unknown	Unknown
Wood Buffalo	WBZPC	49.3100	-114.0000	1190.0	In N/A	Fire	Unknown	Manual
Wood Buffalo	N/A	58.6303	-111.6928	211.8	In 1999-??-??	Fire	Year-round	Automatic
Wood Buffalo	WBREE	N/A	N/A	884.0	In N/A	Fire	Unknown	Manual
Yoho	N/A	51.4693	-116.3450	N/A	In 1993-??-??	General	Year-round	Automatic
Yoho	YOBOU	51.3612	-116.5216	1249.7	In 1993-??-??	General	Year-round	Automatic
Yoho	N/A	51.3612	-116.5216	1249.7	In 1999-??-??	General	Year-round	Automatic
Yoho	YOWAP	51.4833	-116.3333	1700.0	In N/A	Fire	Unknown	Automatic
Yoho	N/A	51.4335	-116.5400	1303.0	In 1995/07/06	General	Unknown	Unknown
Yoho	N/A	51.3500	-116.3333	2027.0	In 1987/12/21	General	Unknown	Unknown
Yoho	YOWYL	51.4428	-116.3440	1615.4	In 1992/10/14	General	Year-round	Automatic

Total stations =	166
Total MSC stations =	83
Total PFIS stations =	77
Total neither =	36 (need manual count when updating records)
General purpose =	81
Avalanche =	9
Fire =	71
Glacier =	1
Landslide =	1
Hydro =	3
Checksum =	166

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- offrir des publications professionnelles, crédibles et précises qui seront soumises à l'évaluation par les pairs.
- favoriser la diffusion de l'information, la créativité, l'efficacité et le travail d'équipe dans les projets de recherche.

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Le rédacteur nommera deux lecteurs choisis, dans la mesure du possible, parmi le personnel scientifique de Parcs Canada, qui seront chargés de faire une critique de chaque manuscrit. On fera appel à des lecteurs de l'extérieur en raison de l'expertise exigée, du temps disponible et de l'objectivité nécessaire. Les lecteurs renverront le manuscrit au rédacteur en y joignant leurs commentaires par écrit. Le rédacteur renverra le manuscrit à son ou à ses auteurs avec les commentaires des lecteurs. L'auteur prendra connaissance des commentaires et tiendra compte de ceux avec lesquels il est d'accord, puis il retournera le manuscrit révisé au rédacteur en lui expliquant par écrit pourquoi il n'a pas tenu compte de certains commentaires. Le rédacteur enverra ensuite le manuscrit au garde de parc en chef, ou, s'il s'agit d'employés du bureau régional, au superviseur immédiat de l'auteur, pour faire approuver la publication et l'impression du manuscrit. Dans le cas de publications de moindre importance, le rédacteur peut, à sa discrétion, décider de ne pas avoir recours à des lecteurs; lui-même et le superviseur immédiat de l'auteur serviront alors de lecteurs. En cas de désaccord entre l'auteur et le rédacteur au sujet du manuscrit, c'est le gestionnaire ministériel principal qui tranchera.

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